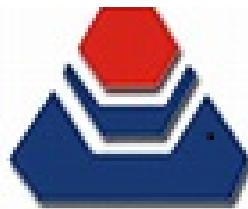


# **Course Management System**

A project report  
submitted in partial fulfillment of the requirements  
for the degree of  
**Bachelor of Technology**  
in  
**Computer Science & Engineering**

by  
**Kartikey Agrahari (1828410043)**  
**Arunjoy Bhadra (1828410029)**  
**Kartikey Singh (1828410045)**  
**Harshit Mishra (1828410042)**

Under the Guidance of  
**Mr. Man Singh**  
(Assistant Professor)



Department of Computer Science & Engineering  
**UNITED INSTITUTE OF TECHNOLOGY PRAYAGRAJ**  
Uttar Pradesh 211010, INDIA.

*(Affiliated to Dr. A.P.J. Abdul Kalam Technical University, Lucknow)*

2021-2022

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I declare that this written submission represents my ideas in my own words and where others' ideas or words have been included, I have adequately cited and referenced the original sources. I declare that I have properly and accurately acknowledged all sources used in the production of this project report.

I also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in my submission. I understand that any violation of the above will be a cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

Date: May 23, 2022

Kartikey Agrahari (1828410043)

Arunjoy Bhadra (1828410029)

Kartikey Singh (1828410045)

Harshit Mishra (1828410042)

# Certificate from the project guide

This is to certify that the work incorporated in the project report entitled “*COURSE MANAGEMENT SYSTEM*” is a record of work carried out by *Kartikey Agrahari (1828410043), Arunjoy Bhadra (1828410029), Kartikey Singh (1828410045), Harshit Mishra (1828410042)* Under my guidance and supervision for the award of Degree of Bachelor of Technology in Computer Science & Engineering.

To the best of my/our knowledge and belief the project report

1. Embodies the work of the candidates themselves,
2. Has duly been completed,
3. Fulfils the requirement of the Ordinance relating to the Bachelor of Technology degree of the University and
4. Is up to the desired standard both in respect of contents and language for being referred to the examiners.

Date: May 23, 2022

Mr. Man Singh

The project work as mentioned above is here by being recommended and Forwarded for examination and evaluation.

Date: May 23, 2022

Head of Department

# Certificate from external examiner

This is to certify that the project report entitled “*COURSE MANAGEMENT SYSTEM*” which is submitted by *Kartikey Agrahari(1828410043)*, *Arunjoy Bhadra(1828410029)*, *Kartikey Singh(1828410045)*, *Harshit Mishra(1828410042)* has been examined by the undersigned as a part of the examination for the award of Degree of *Bachelor of Technology in Computer Science & Engineering*.

Internal Examiner

External Examiner

Date:.....

Date:.....

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# **Abstract**

In the present time, technology and internet have become an essential and integral part of human life. Technology is getting improved and upgraded everyday and it's impact on human life is very much visible in different fields such as transportation, communication, defence, space exploration, agriculture etc. Technology and internet have opened doors of new possibilities for humans and allow us to see the world with different angle.

Teaching methodologies have also been influenced by the impact of technology, such as different universities and institutes across the world are now able to run different online courses in different fields, which allows students to learn new things from any part of the world. We are also trying to utilize the scope provided by technology to bring new changes in teaching methodologies. Therefore, we have developed Course Management System to create an online environment suitable and supportive for the better learning experience both for teachers and students.

Our Course Management System (CMS) is a web based platform that is designed in order to perform all the tasks which are necessary for smooth conduction of courses in online manner. Course Management System acts as a communication bridge between teachers and students, and it also tries to solve problems such as availability of study material, regular assignments, regular assessment of students etc.

# Contents

<b>List of Figures</b>	<b>ix</b>
<b>1 Introduction</b>	<b>1</b>
<b>2 SDLC Model</b>	<b>4</b>
2.1 Requirement gathering and Analysis . . . . .	5
2.2 Design Phase . . . . .	6
2.3 Implementation Phase . . . . .	6
2.4 Testing Phase . . . . .	6
2.5 Deployment . . . . .	7
2.6 Maintenance . . . . .	7
<b>3 Requirement Gathering and Analysis</b>	<b>8</b>
3.1 Requirement Gathering . . . . .	8
3.2 Requirement Analysis . . . . .	9
3.3 System Requirements (Developer): . . . . .	9
3.4 System Requirements (Client): . . . . .	9
3.5 Gantt Chart . . . . .	10
<b>4 Design</b>	<b>11</b>
4.1 Data Flow Diagram . . . . .	13
4.1.1 Level-0 (Context Diagram) Data Flow Diagram . . . . .	13
4.1.2 Level-1 Data Flow Diagram - Admin . . . . .	14
4.1.3 Level-1 Data Flow Diagram - Teacher . . . . .	15
4.1.4 Level-1 Data Flow Diagram - Student . . . . .	16
4.1.5 Use Case Diagram . . . . .	17

4.1.6	Entity Relationship Diagram . . . . .	18
<b>5</b>	<b>User Interface</b>	<b>20</b>
5.1	Project Module View . . . . .	20
5.1.1	Admin . . . . .	20
5.1.2	Teacher . . . . .	28
5.1.3	Student . . . . .	36
<b>6</b>	<b>Testing</b>	<b>43</b>
6.1	TYPES OF TESTING . . . . .	43
6.1.1	UNIT TESTING . . . . .	43
6.1.2	INTEGRATION TESTING . . . . .	44
6.1.3	SYSTEM TESTING . . . . .	44
6.2	Test Cases . . . . .	44
6.2.1	Admin . . . . .	44
6.2.2	Teacher . . . . .	45
6.2.3	Student . . . . .	45
<b>7</b>	<b>Conclusion and Future Work</b>	<b>46</b>
7.1	Conclusion . . . . .	46
7.1.1	Teacher . . . . .	47
7.1.2	Students . . . . .	47
7.2	Future Scope . . . . .	48
<b>A</b>	<b>Publication</b>	<b>49</b>
<b>B</b>	<b>Conceptual Background</b>	<b>50</b>
B.1	HTML . . . . .	50
B.2	CSS . . . . .	51
B.3	JAVA SCRIPT . . . . .	51
B.4	MySQL . . . . .	52
B.5	PHP . . . . .	53
B.6	XAMPP . . . . .	53
B.7	SDLC . . . . .	54

B.8	Waterfall Model . . . . .	55
B.9	Spiral Model . . . . .	56
B.10	V Model . . . . .	57
B.11	RAD Model . . . . .	58

# List of Figures

2.1	Iterative Model	5
3.1	Gantt Chart	10
4.1	Level-0 (Context Diagram) Data Flow Diagram	13
4.2	Level-1 Data Flow Diagram (Admin)	14
4.3	Level-1 Data Flow Diagram (Teacher)	15
4.4	Level-1 Data Flow Diagram (Student)	16
4.5	Use Case Diagram	17
4.6	Entity Relationship Diagram	18
4.7	Entity Relationship Diagram	19
5.1	Admin Login	20
5.2	Admin Dashboard	21
5.3	Admin Users	21
5.4	Teachers	22
5.5	Students	22
5.6	Departments	23
5.7	Subjects	23
5.8	Classes	24
5.9	Downloadable Materials	24
5.10	Uploaded Assignments	25
5.11	School Year	25
5.12	Website Content	26
5.13	User Logs	26
5.14	Activity Log	27

5.15 Teacher's Login Form . . . . .	28
5.16 Teacher's SignUp Form . . . . .	28
5.17 Teacher's Dashboard . . . . .	29
5.18 My Students . . . . .	29
5.19 Subject Overview . . . . .	30
5.20 Downloadable Materials . . . . .	30
5.21 Uploaded Assignments . . . . .	31
5.22 Add Announcements . . . . .	31
5.23 Class Calendar . . . . .	32
5.24 Quiz . . . . .	32
5.25 Notifications . . . . .	33
5.26 Message . . . . .	33
5.27 Add Downloadable . . . . .	34
5.28 Announcements . . . . .	34
5.29 Assignments . . . . .	35
5.30 Student's Login Form . . . . .	36
5.31 Students's SignUp Form . . . . .	36
5.32 Student Dashboard . . . . .	37
5.33 My Classmates . . . . .	37
5.34 My Progress . . . . .	38
5.35 Subject Overview . . . . .	38
5.36 Downloadable Materials . . . . .	39
5.37 Assignments . . . . .	39
5.38 Announcements . . . . .	40
5.39 Class Calendar . . . . .	40
5.40 Notifications . . . . .	41
5.41 Message . . . . .	41
5.42 Backpack . . . . .	42
B.1 Waterfall Model . . . . .	55
B.2 Spiral Model . . . . .	56
B.3 V-Model . . . . .	57
B.4 RAD Model . . . . .	58

# **Chapter 1**

## **Introduction**

In the present time, technology and internet have become an essential and integral part of human life. Technology is getting improved and upgraded everyday and it's impact on human life is very much visible in different fields such as transportation, communication, defence, space exploration, agriculture etc. Technology and internet have opened doors of new possibilities for humans and allow us to see the world with different angle.

Teaching methodologies have also been influenced<sup>2</sup> by the impact of technology, such as different universities and institutes across the world are now able to run different online courses in different fields, which allows students to learn new things from any part of the world. We are also trying to utilize the scope provided by technology to bring positive and revolutionary changes<sup>9</sup> in teaching methodologies.

Process of learning<sup>6</sup> primarily depends on some basic aspects such as proper communication and interaction between teacher and students, availability of study materials, regular assignments and tests for better assessment of students. But conducting online classes on a regular basis can be a difficult task for both teachers and students, because of absence of proper interaction between teachers and students, unavailability of study materials and regular assessment of students. These factors may act as an obstacle in process of learning.

We have developed Course Management System<sup>4</sup> to provide an online platform which can perform all the tasks which are necessary for smooth conduction of courses in online manner such as providing study materials, regular assessment, uninterrupted communication etc.

Because of improvement in technology and access of internet to everyone, information related to every subject is easily available on internet, which helps in upgrading and learning new skills to every individual. These online courses and programs are making the process of learning in-

teractive, easy and seamless for the students, and they do not require to travel far distances for learning.

Course Management System (CMS) offers teachers and students to learn and upgrade their technical, managerial, communication, leadership skills from the comfort of their home. CMS allows the conduction of student learning, performing teaching activities, communication between students and teachers. In this way, CMS enables the possibility of speeding up and simplifying the learning process.

This system basically focuses on college students and teachers and has many benefits. Instead, this system is the possibility of studying completely with distinct groups of college students. They can learn independently without interfering with one other. Here, this system permits shifting of a faculty to the digital format.

With this system<sup>7</sup> and a variety of content material out there, an instructor offers unique, tailor-made study expertise. Hence, a standard class cannot accomplish this. Moreover, this system also provides communication tools similar to a chat, a discussion board, etc. It also permits an instructor to interact with college students and provides a voice to much less sure ones.

Tools provided by CMS are:

- A section for teacher to manage and run classes.
- A section for teacher to upload study materials.
- A section for teacher to upload assignments.
- A section for teacher to organize quizzes.
- A section for teacher to make announcements.
- A section for students to check uploaded study materials.
- A section for students to upload answer copies of assignments.
- A section for students to attempt quizzes.
- A chat section for communication between teachers and students.

## **Existing Systems**

- College ERP :- Our college ERP has provided features like SMS inbox, Discussion Forum, Time table, Notes Assignments, but currently these features are not functional.
- Microsoft Teams :- This application requires a Microsoft account with an active subscription to access all of its features. This application does not arrange uploaded notes in an organized manner.
- WhatsApp :- It is a simple messaging application which was extensively used during the pandemic for sharing notes, examination, class invitation links etc.

## **Objectives of Course Management System**

Course Management System is gracefully created with many functional objectives to make learning<sup>5</sup>, classification, reporting and administrating a fruitful process

- One of the biggest advantages<sup>8</sup> of course management systems is the ability to take it anywhere. An online CMS provides student and faculty with immediate access to organizational training materials wherever they are. This gives them more flexibility to train at convenient times without having to be at their desks.
- A CMS makes it easy for teachers to track student' progress. They can check-in to see how well student are doing and whether or not they're keeping up with the required tasks.
- The course management system holds a superfluity of content within itself, which aims at providing a broad set of information for the learner. Whether it be the student or teacher, they both have an access to a group of resources or rather content which they can access at any point in time. It also confirms that there is no limitation on the volume of the content that the student or teacher can indulge in.
- CMS considerably saves time, money, energy and resources for both students and teachers as well as the institution.
- A CMS not only aim to make the process of learning sessions interesting and enlightening in nature, but it also tries to make it how effective these sessions can be. It tries to ease the process of evaluation with reports ,response and feedback sessions.

# **Chapter 2**

## **SDLC Model**

### **Iterative Model**

The iterative process of software development starts with a simple implementation of a subset of the requirements and then continues to improve the versions as the system is implemented. Each iteration, design revisions, and new functional capabilities were added. The basic idea behind this method is to develop a system through repeated cycles (iterative) and in smaller portions at a time (incremental).

Iterative and incremental development is a combination of iterative design and iterative Method and incremental build model for development. “During software development, more than one iteration of the software development cycle may be running at the same time.” This process involves gradually acquiring new skills or knowledge over time.

In this model, the entire requirement is divided into progressively smaller pieces. Each time the development module goes through the requirements, design, implementation, and testing phases. Each new release of the module adds more functionality to the previous release. The process continues until the system is ready to meet the required requirements.

The key to a successful software development lifecycle is rigorous validation of requirements, and verification testing of each version of the software against those requirements within each cycle of the model. As the software evolves, it must be repeatedly tested and extended to verify each version. The purpose of an effective software development process is to deliver a high-quality product that meets the customer’s needs. The SDLC has outlined a series of steps that encompass requirement gathering, designing, coding, testing, and maintaining the project. It is important to follow the proper stages in product development to ensure a systematic approach.

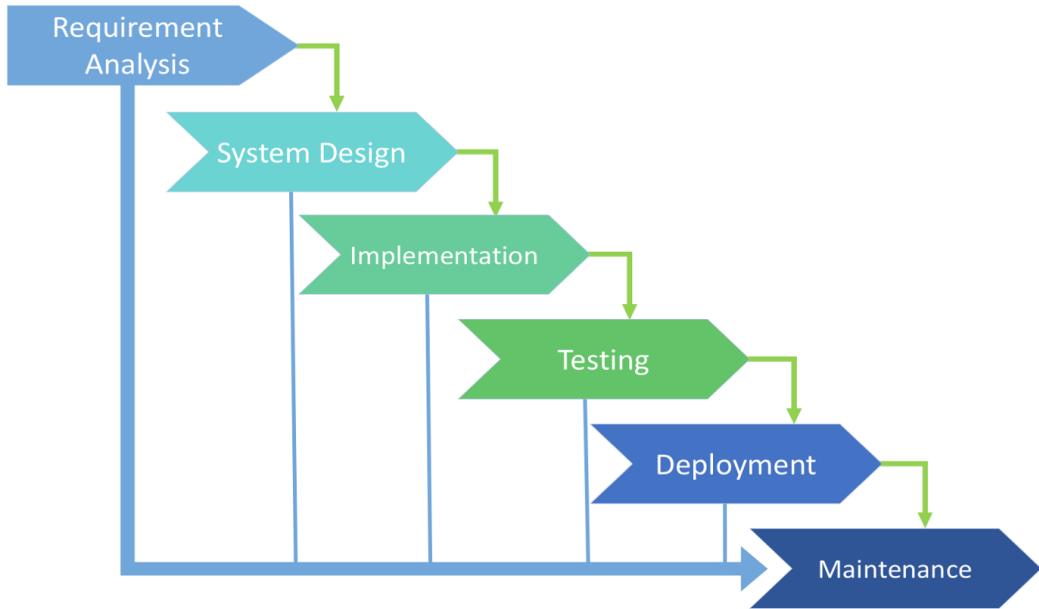


Figure 2.1: Iterative Model

17

## 2.1 Requirement gathering and Analysis

In this phase, we have tried to gather the information from teachers and students about their experience during conduction of online classes on a regular basis. On basis of gathered information and personal observation, we have came to the conclusion that regular conduction of online classes, sharing of study material, conduction of examination and regular assessment of students was a difficult job.

In the analysis phase we analysed all the gathered information related to requirements and problems of teachers and students, and we decided to develop a platform which have features to;

- Upload and download study material.
- Upload and download assignments.
- Organize and attempt quizzes.
- Insert, modify and delete students' and teachers' data.
- Communicate with each other using chat section for better interaction.

## **2.2 Design Phase**

After successful completion of requirement analysis, design of the software takes place. Designing is a way of turning user requirements into a suitable form so that the programmer can work on coding and implementation more easily.

Software design is a process of planning the structure of your software application. Software design is a process that involves several stages. The software itself is a complex, multi-layered spectrum, and its design features multiple intermediate steps, which means that different types of software design are possible.

In the design phase we have developed Level-0 Data Flow Diagram, Level-1 Data Flow Diagram, Use case Diagram and Entity Relationship Diagram.

## **2.3 Implementation Phase**

After successful completion of design phase, implementation phase takes place. It is the most important phase of the iterative model because in this phase actual coding process is executed. All planning, specification, and design documents up to this point have been coded and implemented into this initial iteration of the project.

In this phase the software design is implemented in the form of code written for specific compilers and interpreters on a computer following the rules of the programming languages used. For designing of our project we have used following programming languages:- HTML, CSS, PHP, Javascript, MySQL.

## **2.4 Testing Phase**

After successful completion of implementation phase testing of the product is performed. Process of testing is usually referred as a subset of all the phases in the modern software development model, with testing activities mostly occurring in all the stages of the development process. However, this refers to the testing stage of the product where product defects are reported, tracked, fixed, and retested until the product meets quality standards defined in the SRS.

After successful completion of our project we have performed three types of testing on our project, which are as follows:- Unit Testing, Integration Testing, System Testing.

## **2.5 Deployment**

After successful completion of testing phase, a report is generated about all the test cases of the project which shows that the project is ready for release, it is released formally in the appropriate market. Sometimes products are deployed in stages according to the business strategy of the organization. The product may be released in a limited segment and tested in the real business environment.

In this phase we have deployed our project on multiple computer systems having different configurations to test the performance of our project.

## **2.6 Maintenance**

After the deployment of the project in the market, it requires regular updating and maintenance according to the changes in the requirements and suggestions of the client.

Based on the feedback, the product may be released as it is or with suggested enhancements in the targeting market segment. After the product is released into the market, its support is provided for the existing customer base.

# **Chapter 3**

## **Requirement Gathering and Analysis**

In this phase, requirements for a software to be developed are raised. These requirements will be in a language that is understood by the customer or user. Specific terminology is recommended for the domain in question.

Requirements are an important part of planning when determining what an application is supposed to do and what its requirements are. A social media application would need the ability to connect to a friend. A search feature may be necessary for an inventory program. In order to build the project, you will need to identify the necessary resources. For example, a team might develop software to operate a custom manufacturing machine.

During this phase, all relevant information is collected from the customer in order to develop a product according to their expectations. In this phase, any ambiguities must be resolved. The business analyst and project manager scheduled a meeting with the customer to get all the information about what the customer wants to build and who will be the end-user. The purpose of the product is also known. Before building a product, it is important to have a good understanding of the product.

### **3.1 Requirement Gathering**

In this phase, we have tried to gather the information from teachers and students about their experience during conduction of online classes on a regular basis.

On basis of gathered information and personal observation, we have came to the conclusion that regular conduction of online classes, sharing of study material, conduction of examination and regular assessment of students was a difficult job.

## **3.2 Requirement Analysis**

- Able to upload and download study material.
- Able to upload and take quizzes.
- Able to insert, modify and delete student and teachers data.
- Able to connect with each other using chat section for better communication.

## **3.3 System Requirements (Developer):**

### **Hardware Requirements:**

- 1 GB RAM.
- 1 Core CPU.
- x86 64-bit CPU (Intel / AMD architecture)
- 10 GB HDD Storage.

### **Software Requirements:**

- Web Browser (Chrome / Firefox / Microsoft Edge)
- XAMPP server
- MySQL database
- An Internet connection
- Any code editor (Sublime text editor)

## **3.4 System Requirements (Client):**

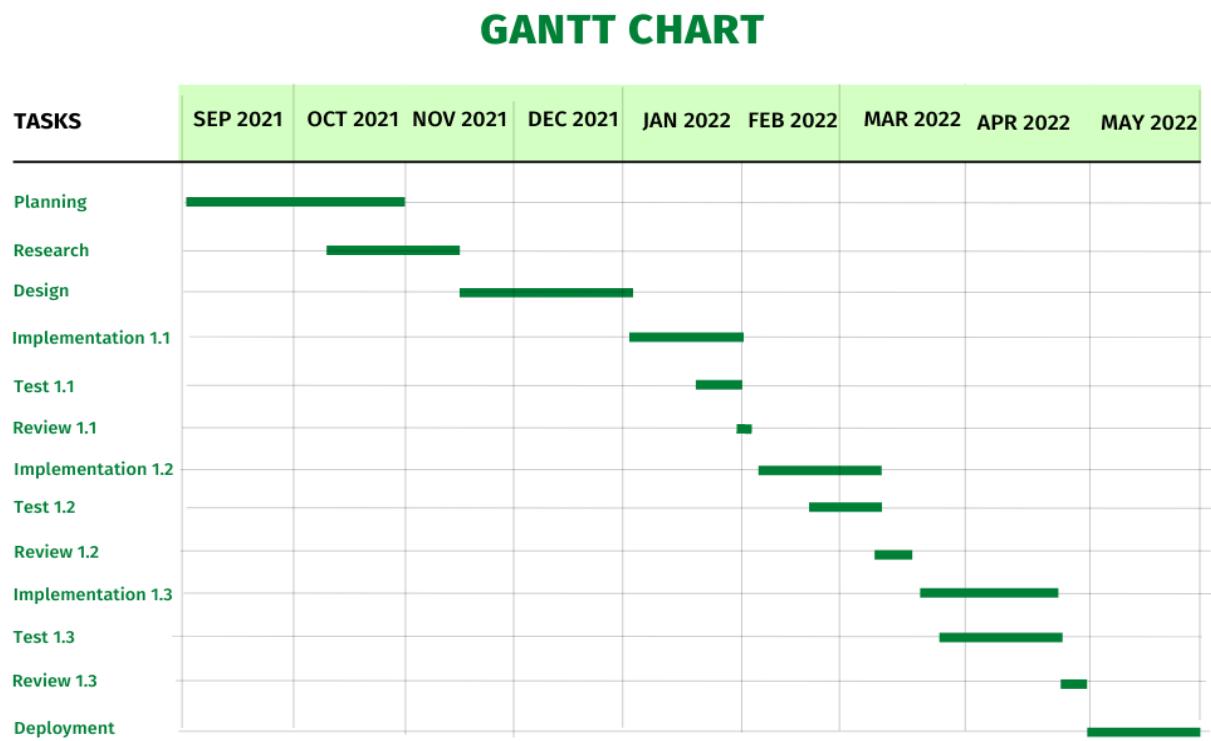
### **Hardware Requirements:**

- 1 GB Ram
- 2 GB available storage space
- Any CPU

### **Software Requirements**

- Web browser (Chrome / Firefox / Microsoft Edge)
- An Internet connection

### 3.5 Gantt Chart



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Figure 3.1: Gantt Chart

# Chapter 4

## Design

After successful completion of requirement analysis, design of the software takes place. Designing is a way of turning user requirements into a suitable form so that the programmer can work on coding and implementation more easily. Software design is a process of planning the structure of your software application.

Software design is a process that involves several stages. The software itself is a complex, multi-layered spectrum, and its design features multiple intermediate steps, which means that different types of software design are possible.

Designing is a way of turning user requirements into a suitable form so that the programmer can work on coding and implementation more easily. The software development process involved representing the requirements as described in the SRS document.

The design of a system often varies depending on the environment in which it is used. For example, reliable frameworks can be used in certain environments, while design patterns may be more appropriate in other contexts.

In the design phase we have developed Level-0 Data Flow Diagram, Level-1 Data Flow Diagram, Use case Diagram and Entity Relationship Diagram.

**Level-0 DFD :-** This Level-0 DFD of course management system shows how each external entity (Admin, Teacher, Student) will interact with the system. This diagram has three external entities named Admin, Teacher, Student and it contains one process named Course Management System. It is a diagramming tool that help you to visualize the flow of data between different part of the system. Data flow diagram can range from simple drawings that simply overview a process, to more in-depth diagrams that explore the details of how data is handled.

**Level-1 DFD :-** Above diagram represents the Level-1 DFD of Admin of Course Management System. Level-1 DFD is designed to highlight the major features and functions of the system and for generating small segments of the high-level process of 0-level DFD. In Level-1 DFD, we have shown all the processes, with the help of circle, that will be executed by the admin of the system such as Sign Up, Login, Log out etc.

**Use case Diagram :-** We have designed use case diagram according to the requirements of our project and it has three actors (Admin, Teacher, Student) which shows the people who will employ the use cases. In this use case diagram, we have shown all the use cases of each user with the help of horizontally shaped ovals, and their interactions with the help of arrows.

**Entity Relationship Diagram :-** ER diagram generally refers to Entity Relationship diagram. It is the diagram which is used to display the relationship between each entity set stored in a data base and ER diagram is a very important tool used for understanding the structure of data base. Entity relation diagram usually used multiple symbols in order to represent entities, attributes and relationship. It is often recommended to create an ER diagram before implementing a database.

## 4.1 Data Flow Diagram

A data flow diagram (DFD) is a traditional visual representation of the flow of information within a system. DFD of course management system shows how each external entity (Admin, Teacher, Student) will interact with the system. This diagram has three external entities named Admin, Teacher, Student and it contains one process named Course Management System. Data flow diagram can range from simple drawings that simply overview a process, to more in-depth diagrams that explore the details of how data is handled.

### 4.1.1 Level-0 (Context Diagram) Data Flow Diagram

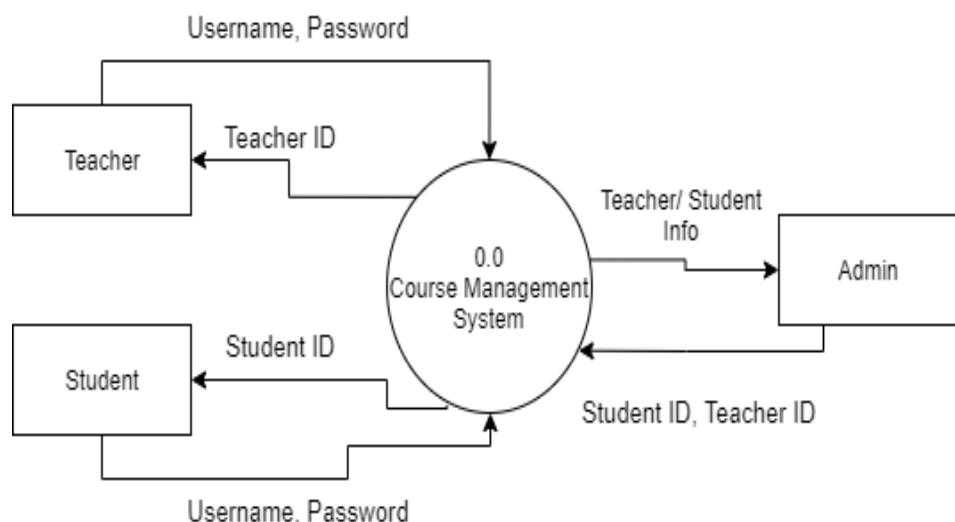


Figure 4.1: Level-0 (Context Diagram) Data Flow Diagram

Above diagram represents the Level-0 DFD of Course Management System. It gives a basic overview of the whole system and the processes that are being executed. It's designed to provide an at-a-glance view to the client, and to show the system in a form of a single high-level process, along with its relationship with external entities.

This diagram has three external entities named **Admin**, **Teacher**, **Student** and it contains one process named **Course Management System**. This Level-0 DFD of course management system shows how each external entity (Admin, Teacher, Student) will interact with the system. We can easily understand with the help of the diagram that each external entity must have a unique username and password in order to interact with the system.

#### 4.1.2 Level-1 Data Flow Diagram - Admin

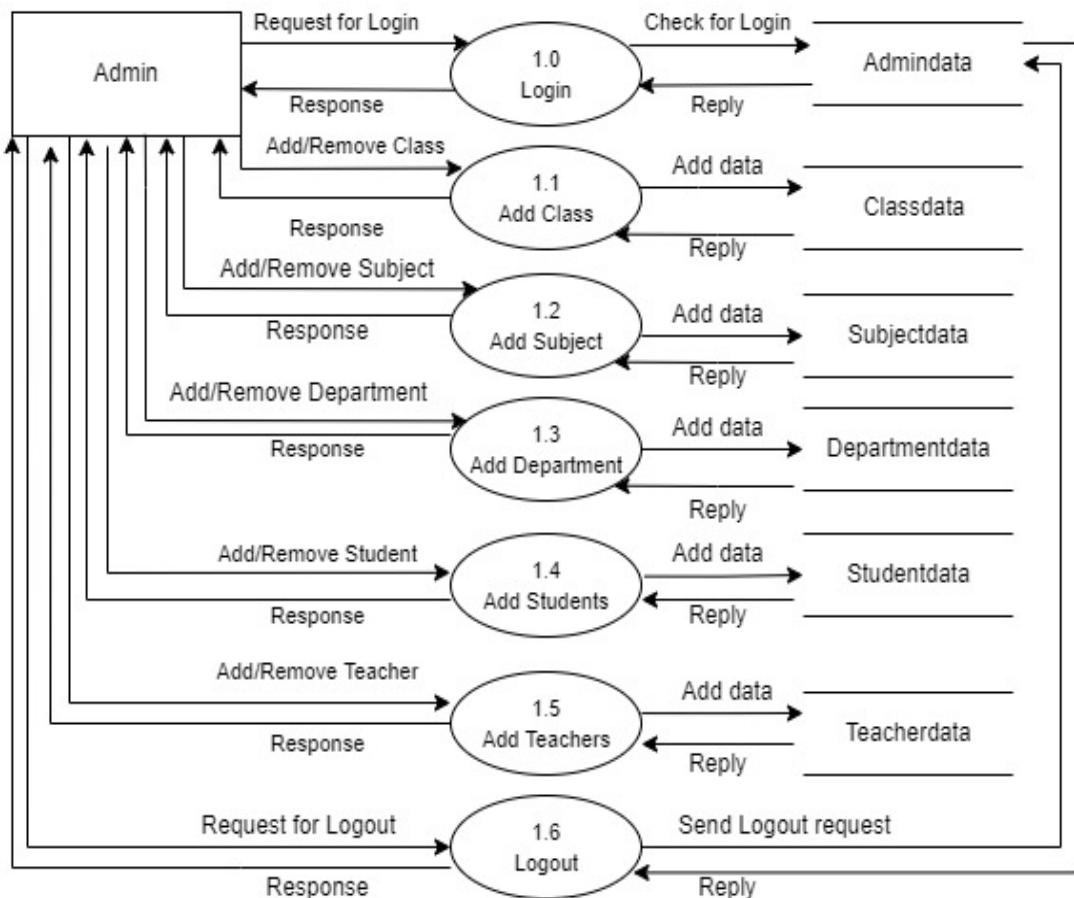


Figure 4.2: Level-1 Data Flow Diagram (Admin)

Above diagram represents the Level-1 DFD of Admin of Course Management System. Level-1 DFD is designed to highlight the major features and functions of the system and for generating small segments of the high-level process of 0-level DFD.

In Level-1 DFD, we have shown all the processes, with the help of circle, that will be executed by the admin of the system such as **Login**, **Add class data**, **Add subject data**, **Add Department data**, **Add student's data**, **Add teacher's data**.

This DFD also shows the flow of data with the help of arrows, that will take place when a specific process gets executed in the system.

It also represents the data store of the system which stores all the data which is necessary for execution of processes and functioning of the system.

### 4.1.3 Level-1 Data Flow Diagram - Teacher

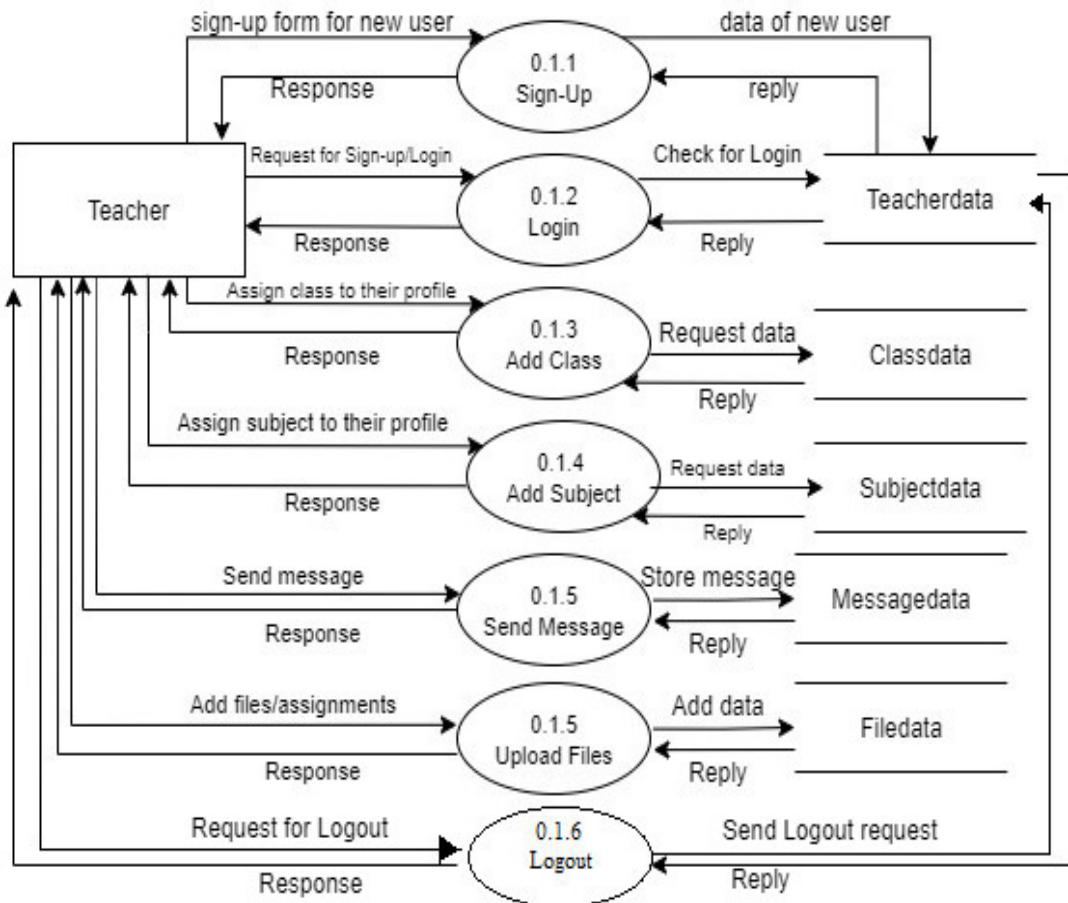


Figure 4.3: Level-1 Data Flow Diagram (Teacher)

Above diagram represents the Level-1 DFD of Teacher of Course Management System. Level-1 DFD is designed to highlight the major features and functions of the system and for generating small segments of the high-level process of 0-level DFD.

In Level-1 DFD, we have shown all the processes, with the help of circle, that will be executed by the teacher of the system such as **Sign Up**, **Login**, **Add class data**, **Add subject data**, **Send message**, **Upload files**, **Add quizzes**.

This DFD also shows the flow of data with the help of arrows, that will take place when a specific process gets executed in the system.

It also represents the data store of the system which stores all the data which is necessary for execution of processes and functioning of the system.

#### 4.1.4 Level-1 Data Flow Diagram - Student

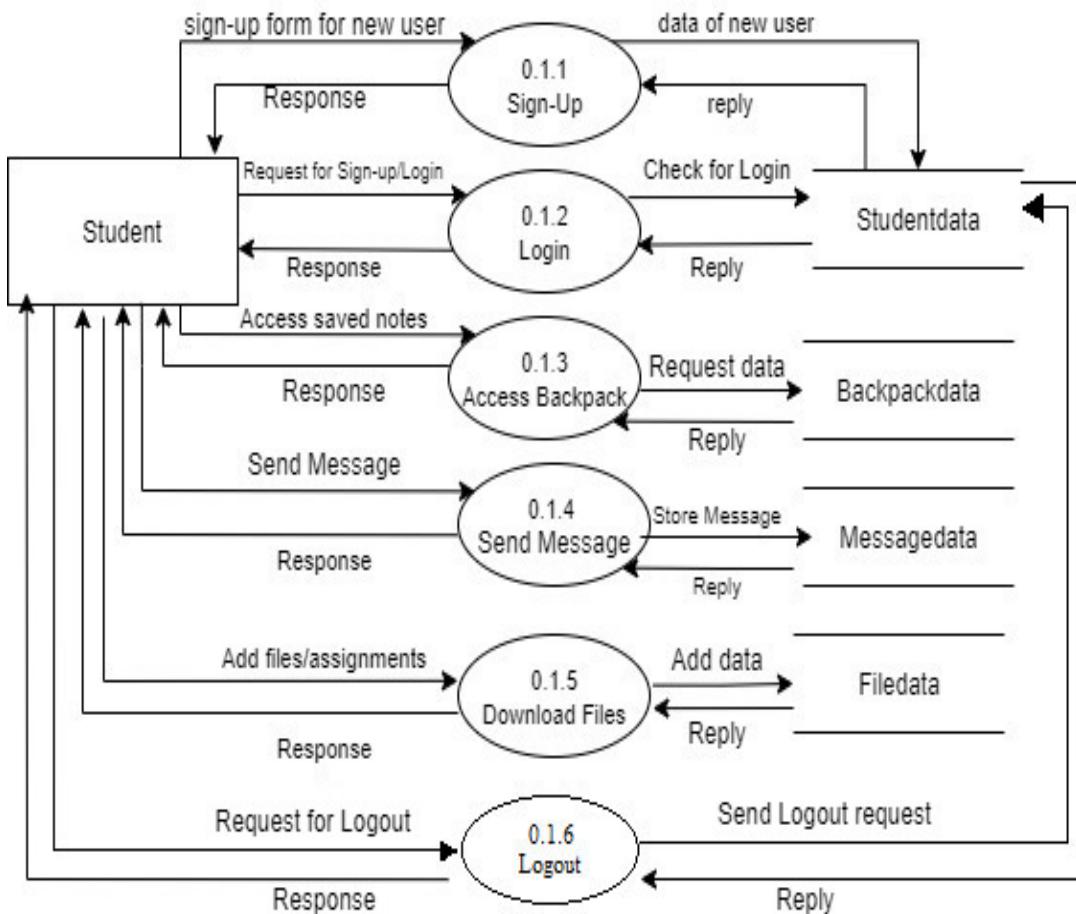


Figure 4.4: Level-1 Data Flow Diagram (Student)

Above diagram represents the Level-1 DFD of Student of Course Management System. Level-1 DFD is designed to highlight the major features and functions of the system and for generating small segments of the high-level process of 0-level DFD.

In Level-1 DFD, we have shown all the processes, with the help of circle, that will be executed by the admin of the system such as **Sign Up**, **Login**, **Access Backpack**, **Send messages**, **Download files**, **Attempt Quizzes**.

This DFD also shows the flow of data with the help of arrows, that will take place when a specific process gets executed in the system.

It also represents the data store of the system which stores all the data which is necessary for execution of processes and functioning of the system.

#### 4.1.5 Use Case Diagram

We have designed use case diagram according to the requirements of our project and it has three actors (Admin, Teacher, Student) which shows the people who will employ the use cases. In this use case diagram, we have shown all the use cases of each user with the help of horizontally shaped ovals, and their interactions with the help of arrows.

1. **Admin :-** Login, Classroom and department creation, Checks user logs and activity logs, Add and delete user's data, Control website data, Checks downloaded and uploaded contents.
2. **Teacher :-** Sign up, Login, Classroom activation, Notes and assignment uploading, Uploading grades, Announcements, Message.
3. **Student :-** Sign up, Login, Notes and assignment uploading, Access to backpack, Messages.

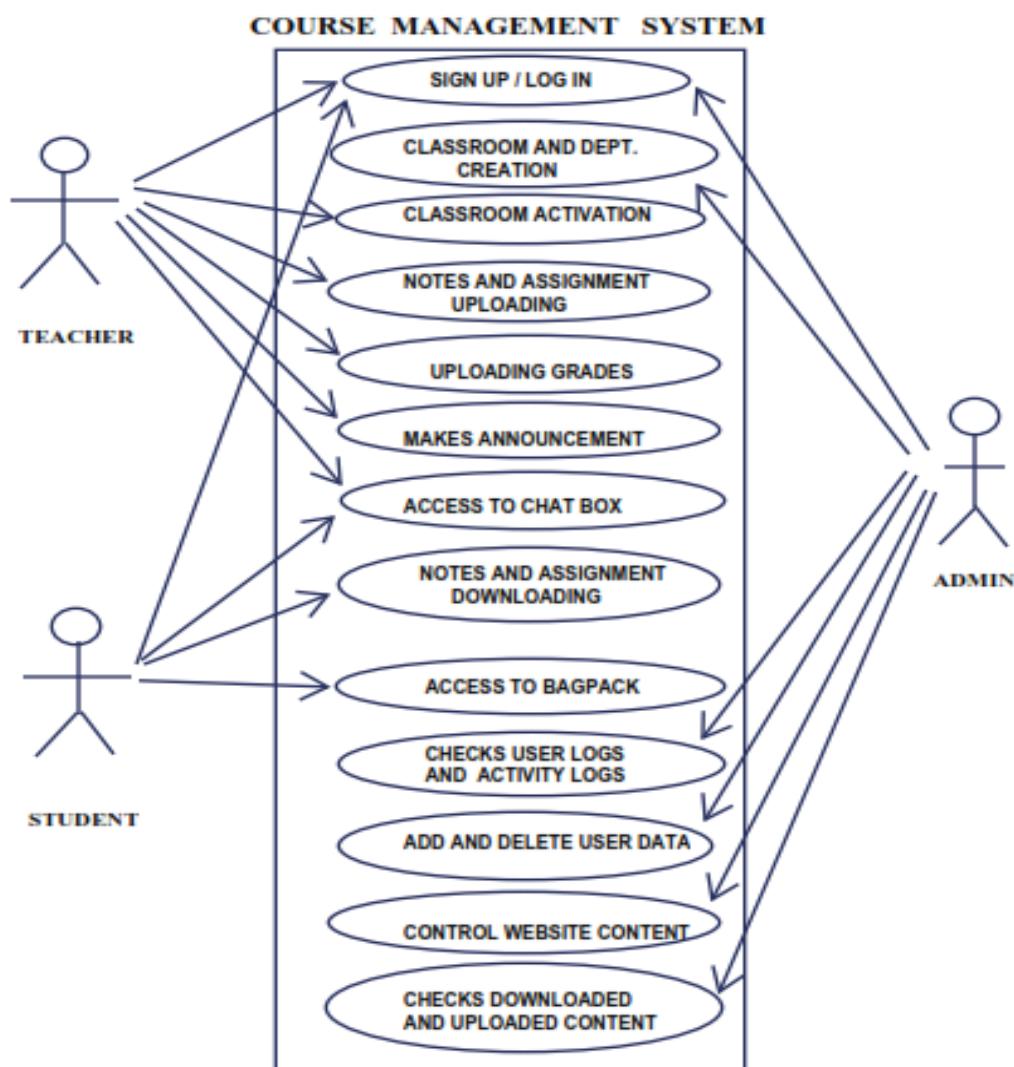


Figure 4.5: Use Case Diagram

#### 4.1.6 Entity Relationship Diagram

ER diagram generally refers to Entity Relationship diagram. It is the diagram which is used to display the relationship between each entity set stored in a data base and ER diagram is a very important tool used for understanding the structure of data base. Entity relation diagram usually used multiple symbols in order to represent entities, attributes and relationship. An ER diagram can have multiple entities and these entities can have multiple attributes, among all those attributes there should be one key attribute by which that entity will be uniquely identified. We have designed entity relationship diagram according to the requirement of our project with the intention to represent the relationships among all the entities of the database. List of symbols used in Entity Relationship Diagram :-

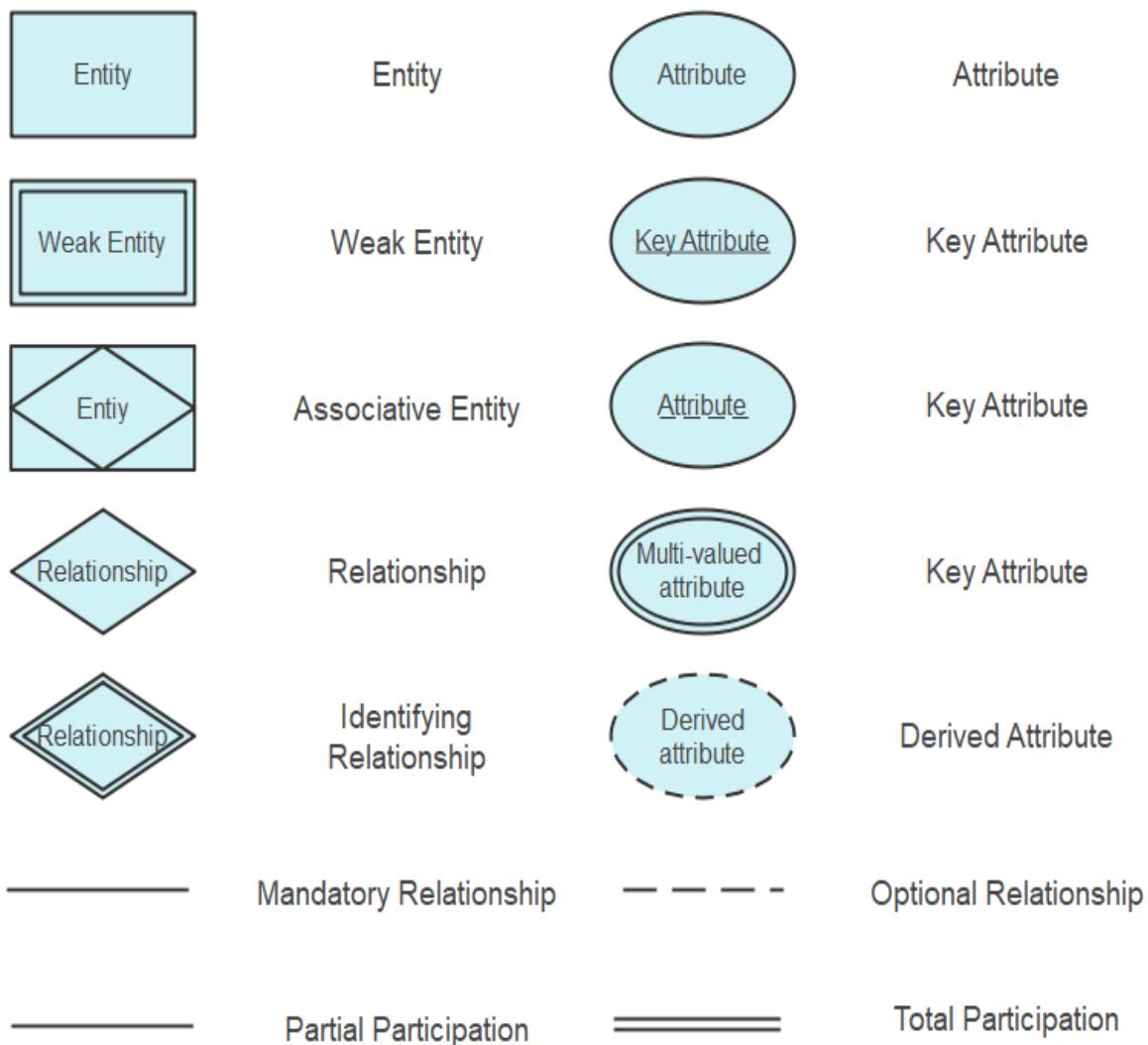


Figure 4.6: Entity Relationship Diagram

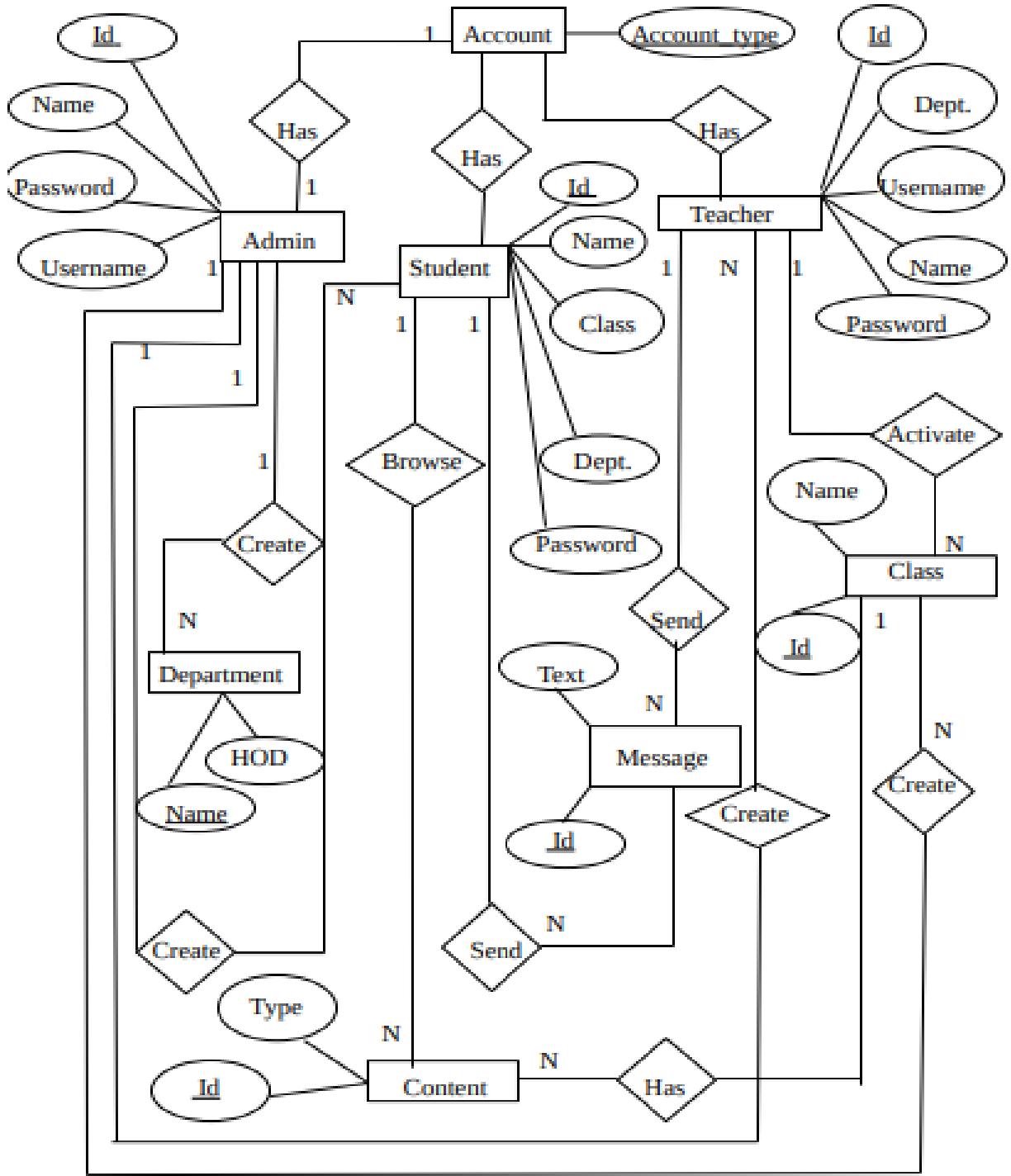


Figure 4.7: Entity Relationship Diagram

# Chapter 5

## User Interface

The third and the most important phase of the iterative model is the implementation phase. The actual coding process can be executed here. All planning, specification, and design documents up to this point have been coded and implemented into this initial iteration of the project.

### 5.1 Project Module View

#### 5.1.1 Admin

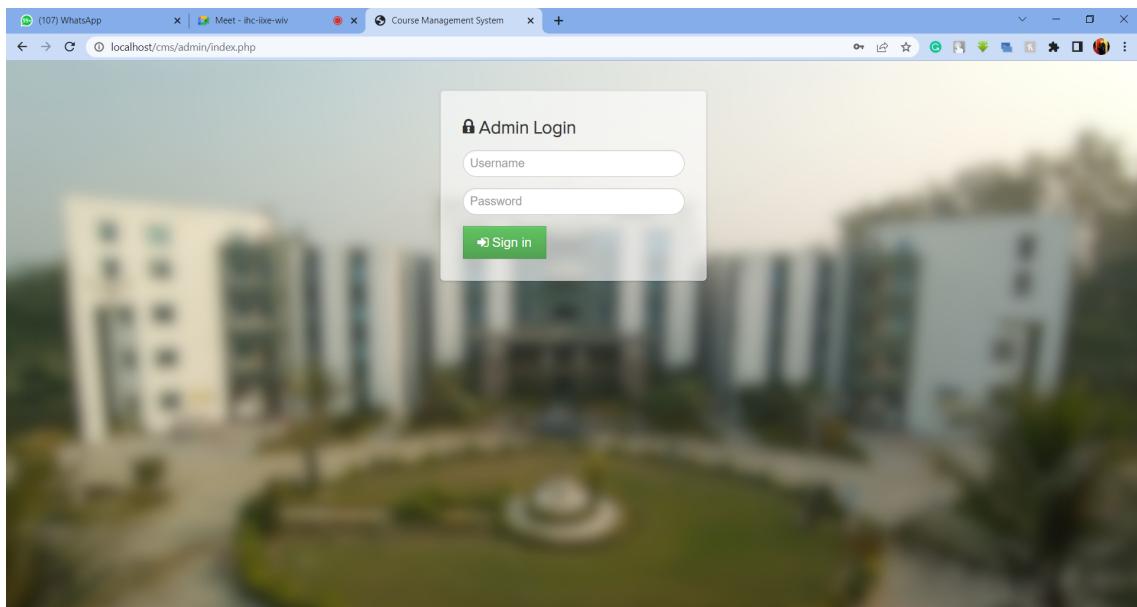


Figure 5.1: Admin Login

-> User can enter his/her username and password in this form, to access admin panel.

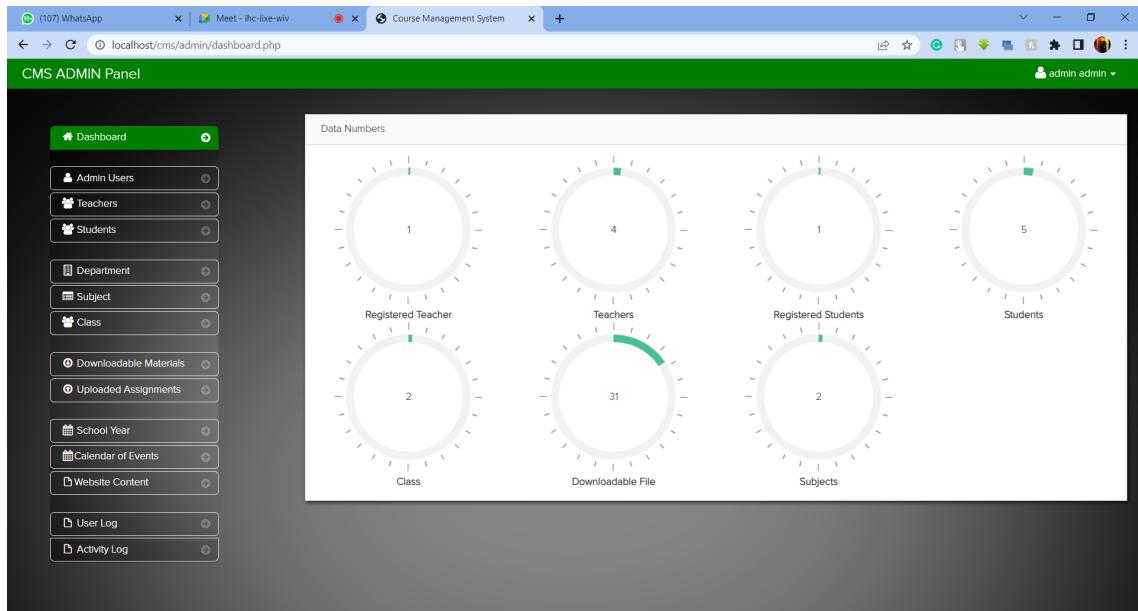


Figure 5.2: Admin Dashboard

-> Admin dashboard is the homepage and it gives all the statistical information of the website to the user.

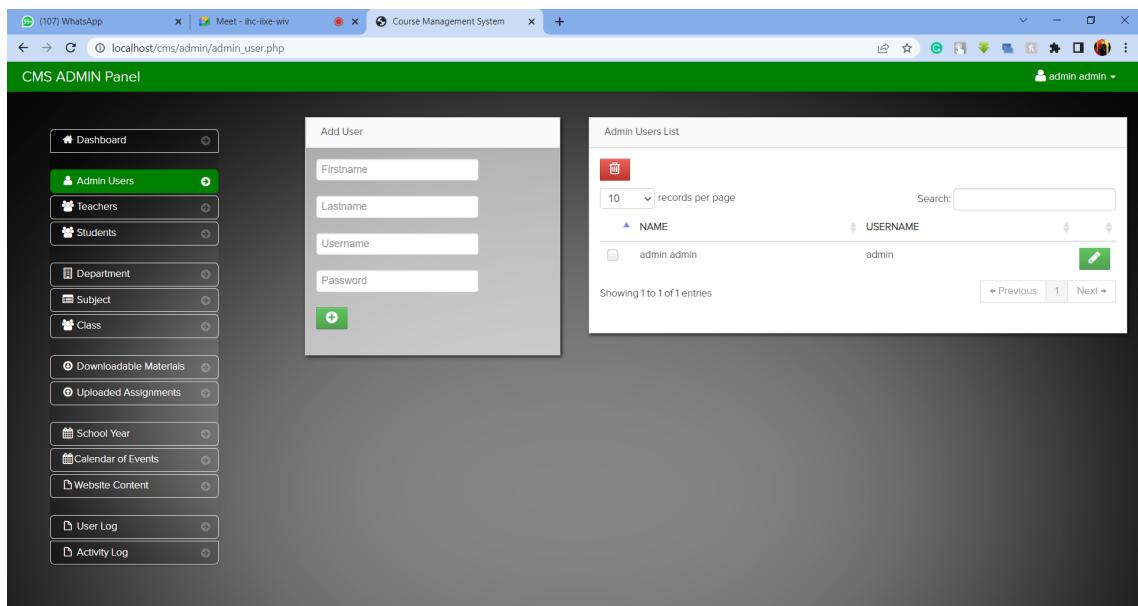


Figure 5.3: Admin Users

-> Admin can insert, modify and delete data of other admin users.

Figure 5.4: Teachers

-> Admin can insert, modify and delete data of teachers.

Figure 5.5: Students

-> Admin can insert, modify and delete data of students.

The screenshot shows the CMS Admin Panel with the title 'Course Management System'. The left sidebar has a green header 'CMS ADMIN Panel' and a list of modules: Dashboard, Admin Users, Teachers, Students, Department (highlighted in green), Subject, Class, Downloadable Materials, Uploaded Assignments, School Year, Calendar of Events, Website Content, User Log, and Activity Log. The main area has two tabs: 'Add Department' (active) and 'Department List'. The 'Add Department' tab contains fields for 'Deparment' and 'Person Incharge' with a green '+' button. The 'Department List' tab shows a table with two entries:

DEPARTMENT	PERSON IN-CHARGE
Computer Science and Information Technology	Abhishek Malviya
Electrical Engineering	Swaroop Malick

Buttons for 'Search', 'records per page' (set to 10), and navigation ('Previous', 'Next') are also present.

Figure 5.6: Departments

-> Admin can insert, modify and delete data of departments.

The screenshot shows the CMS Admin Panel with the title 'Course Management System'. The left sidebar has a green header 'CMS ADMIN Panel' and a list of modules: Dashboard, Admin Users, Teachers, Students, Department, Subject (highlighted in green), Class, Downloadable Materials, Uploaded Assignments, School Year, Calendar of Events, Website Content, User Log, and Activity Log. The main area has two tabs: 'Subject List' (active) and 'Add Subject'. The 'Subject List' tab shows a table with two entries:

SUBJECT CODE	SUBJECT TITLE
KCS701	MACHINE LEARNING
KCS705	AI

Buttons for 'Search', 'records per page' (set to 10), and navigation ('Previous', 'Next') are also present.

Figure 5.7: Subjects

-> Admin can insert, modify and delete data of subjects.

Figure 5.8: Classes

-> Admin can insert, modify and delete data of classes.

DATE UPLOAD	FILE NAME	DESCRIPTION	UPLOAD BY	CLASS
2022-04-07 17:02:27	acadmeic	calendar	Man Singh	CS A 4TH YEAR
2022-04-07 17:08:29	logic	calendar	Man Singh	CS A 4TH YEAR
2022-04-07 17:08:30	logic	calendar	Man Singh	CS-B 5TH YEAR
2022-04-07 17:24:28	guddu	code	Man Singh	CS A 4TH YEAR
2022-04-07 17:24:28	guddu	code	Man Singh	CS-B 5TH YEAR
2022-04-07 17:55:21	panditt	panditt	Man Singh	CS A 4TH YEAR
2022-04-07 17:55:21	panditt	panditt	Man Singh	CS-B 5TH YEAR

Figure 5.9: Downloadable Materials

-> Admin can check the information of downloadable materials.

The screenshot shows the CMS Admin Panel interface. On the left is a sidebar with various administrative options: Dashboard, Admin Users, Teachers, Students, Department, Subject, Class, Downloadable Materials, **Uploaded Assignments** (which is currently selected), School Year, Calendar of Events, Website Content, User Log, and Activity Log. The main content area is titled 'Assignment File Uploaded List'. It includes a search bar, a dropdown for 'records per page' set to 10, and columns for FILE NAME, DESCRIPTION, DATE UPLOAD, UPLOAD BY, and CLASS. A message indicates 'No data available in table' and 'Showing 0 to 0 of 0 entries'. Navigation buttons for 'Previous' and 'Next' are at the bottom.

Figure 5.10: Uploaded Assignments

-> Admin can check the information of uploaded assignments.

The screenshot shows the CMS Admin Panel interface. The sidebar is identical to Figure 5.10. The main content area has two parts: a modal window titled 'Add School Year' containing a 'School Year' input field and a green '+' button, and a table titled 'School Year List' showing one entry: '2021-2022'. The table includes a delete icon, a search bar, a dropdown for 'records per page' set to 10, and columns for SCHOOL YEAR and CLASS. A message indicates 'Showing 1 to 1 of 1 entries'. Navigation buttons for 'Previous' and 'Next' are at the bottom.

Figure 5.11: School Year

-> Admin can insert and delete information of school year.

The screenshot shows the CMS Admin Panel with a green header bar. The left sidebar contains a navigation menu with items like Dashboard, Admin Users, Teachers, Students, Department, Subject, Class, Downloadable Materials, Uploaded Assignments, School Year, Calendar of Events, Website Content (which is highlighted in green), User Log, and Activity Log. The main content area is titled 'Content' and displays a list of website entries. The columns include 'TITLE', 'Mission', 'Calendar', 'Directories', 'president', 'motto', 'Campuses', 'Vision', 'History', 'Footer', and 'Upcoming Events'. Each entry has a green edit icon next to it. A search bar at the top right says 'Search:'. At the bottom, it shows 'Showing 1 to 10 of 13 entries' and a page navigation with links for Previous, 1, 2, Next.

Figure 5.12: Website Content

-> Admin can insert, modify and delete all the written content of the website like mission, vision, contacts etc.

The screenshot shows the CMS Admin Panel with a green header bar. The left sidebar contains a navigation menu with items like Dashboard, Admin Users, Teachers, Students, Department, Subject, Class, Downloadable Materials, Uploaded Assignments, School Year, Calendar of Events, Website Content, User Log (which is highlighted in green), and Activity Log. The main content area is titled 'Users Log List' and displays a table of user log entries. The columns are labeled 'DATE LOGIN', 'DATE LOGOUT', and 'USERNAME'. The data shows various logins and logouts for a user named 'admin' on different dates. A search bar at the top right says 'Search:'. At the bottom, it shows 'Showing 1 to 10 of 31 entries' and a page navigation with links for Previous, 1, 2, 3, 4, Next.

Figure 5.13: User Logs

-> Admin can check the user log of the website.

Assignment File Uploaded List		
10	records per page	Search:
DATE	USER	ACTION
2022-02-20 13:45:43	admin	Add Subject KCS701
2022-02-20 13:59:44	admin	Add School Year 2021-2022
2022-04-01 16:51:13	admin	Add User kartikey
2022-04-02 16:12:28	admin	Add School Year 2022-23
2022-04-03 16:26:43	admin	Add Subject KCS702
2022-04-03 16:27:01	admin	Edit Subject KCS702
2022-04-03 16:28:24	admin	Add Subject KCS705

Showing 1 to 7 of 7 entries

← Previous 1 Next →

Figure 5.14: Activity Log

-> Admin can check the activity log of the website.

## 5.1.2 Teacher

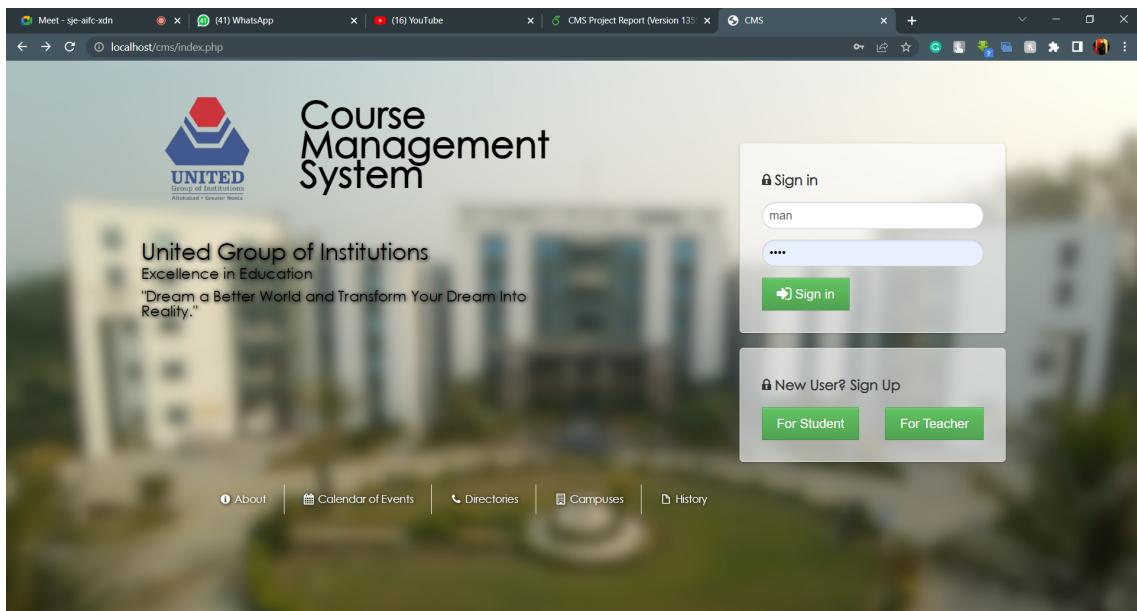


Figure 5.15: Teacher's Login Form

- > Teacher can enter his/her username and password in this form, to access his/her account.

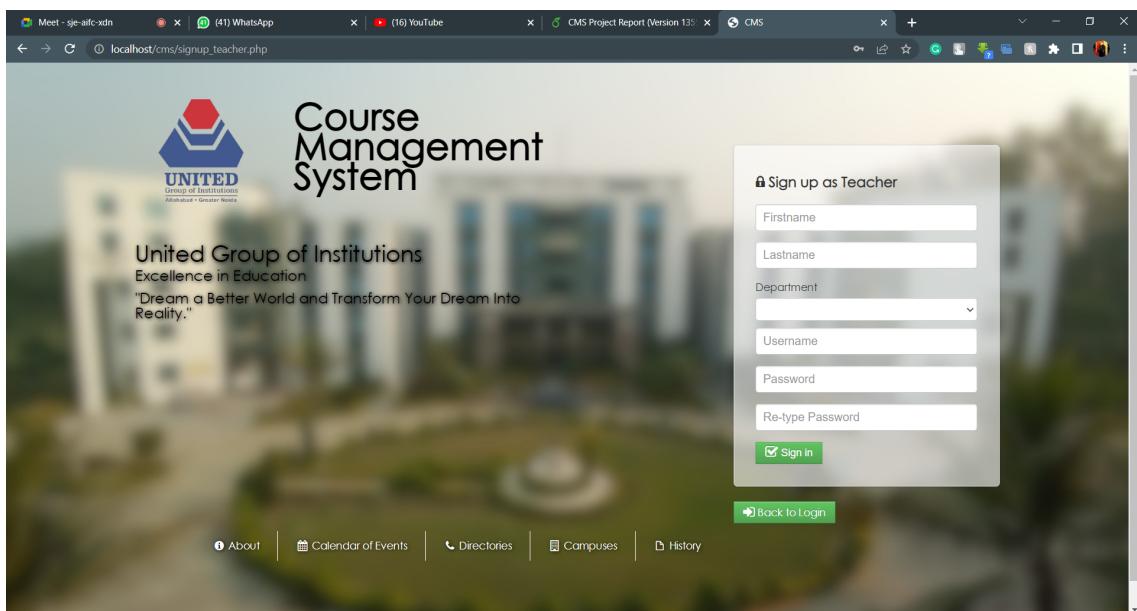


Figure 5.16: Teacher's SignUp Form

- > A new user can enter his/her basic details in this form, to get registered in the system.

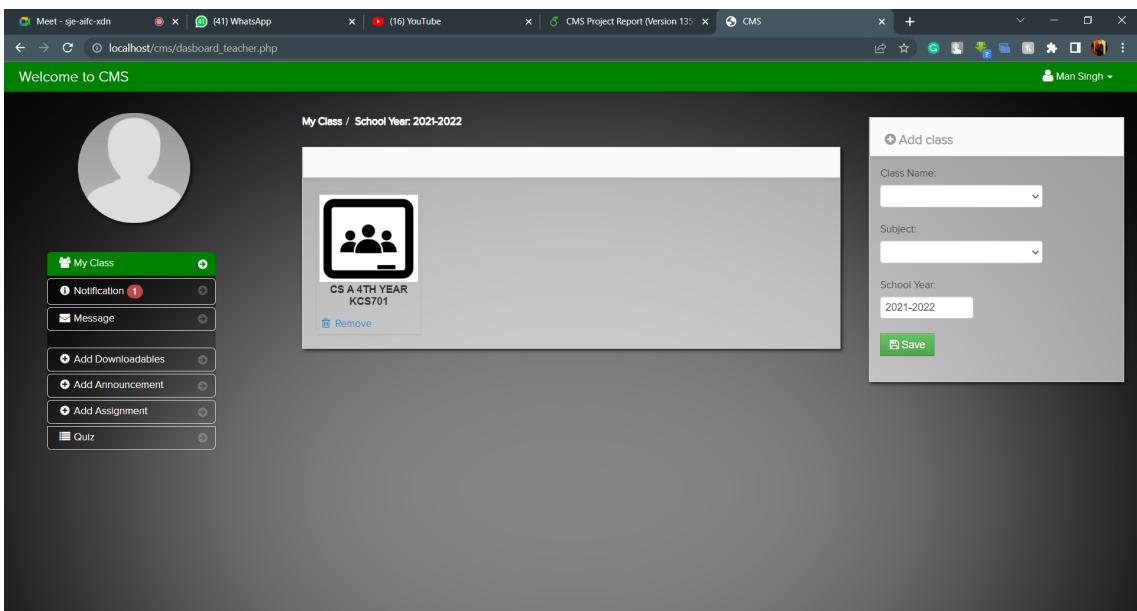


Figure 5.17: Teacher's Dashboard

-> This is the home page of teacher's account.

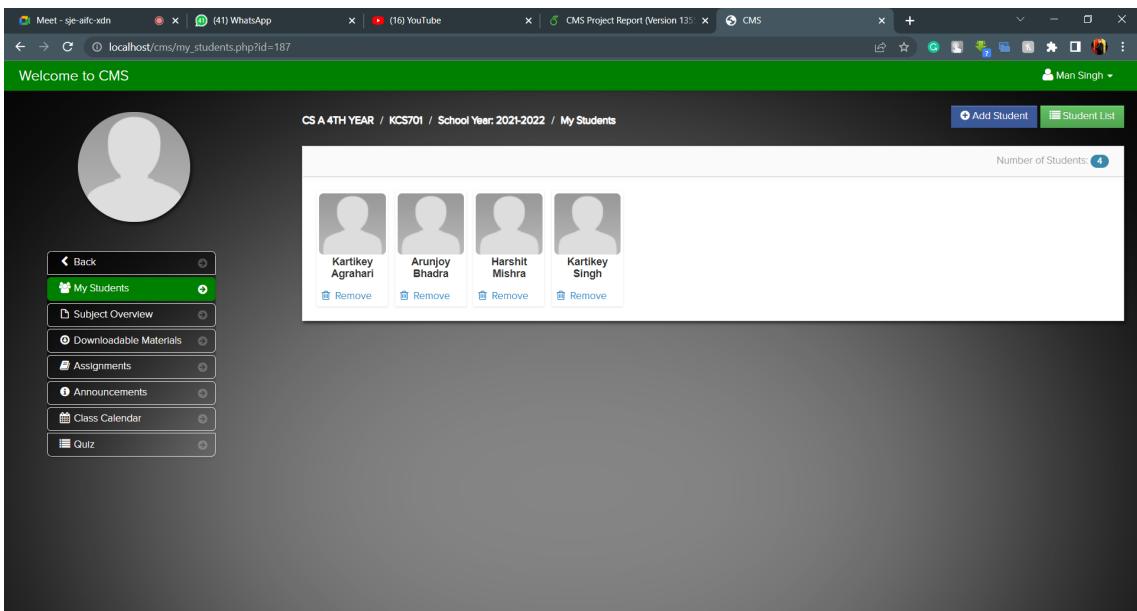


Figure 5.18: My Students

-> Teacher can manage students from this page.

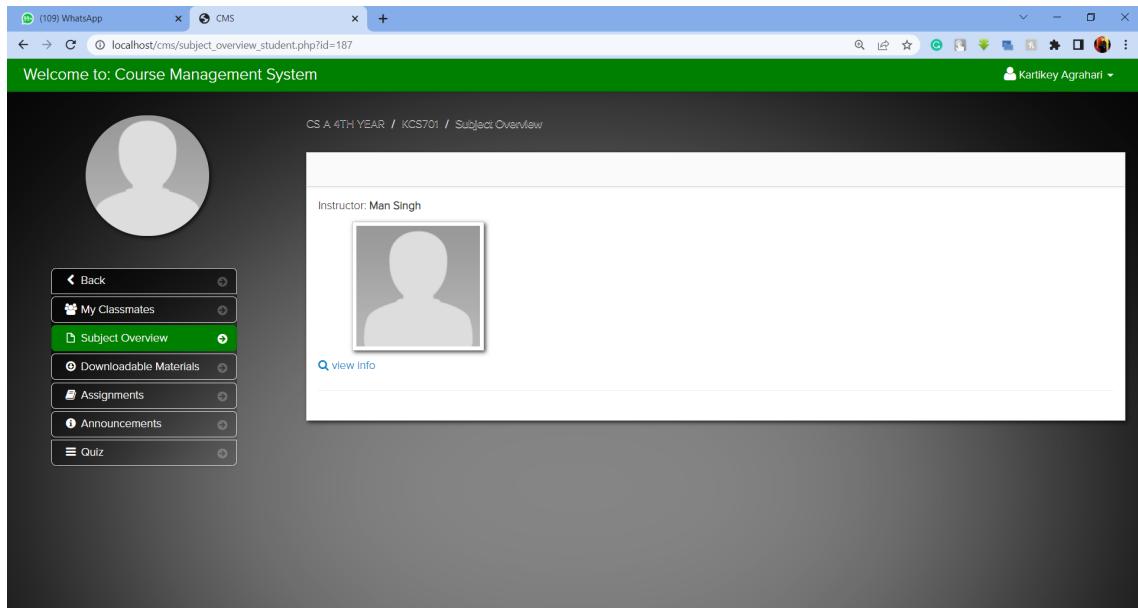


Figure 5.19: Subject Overview

-> Teacher can upload syllabus of his/her subject.

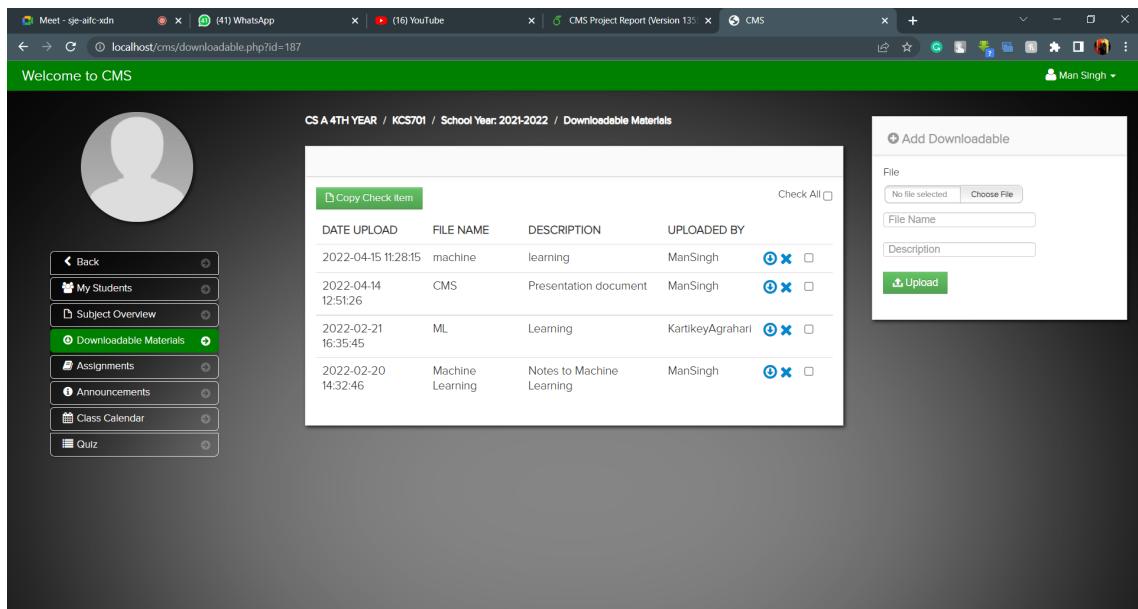


Figure 5.20: Downloadable Materials

-> Teacher can upload study materials for students from this page.

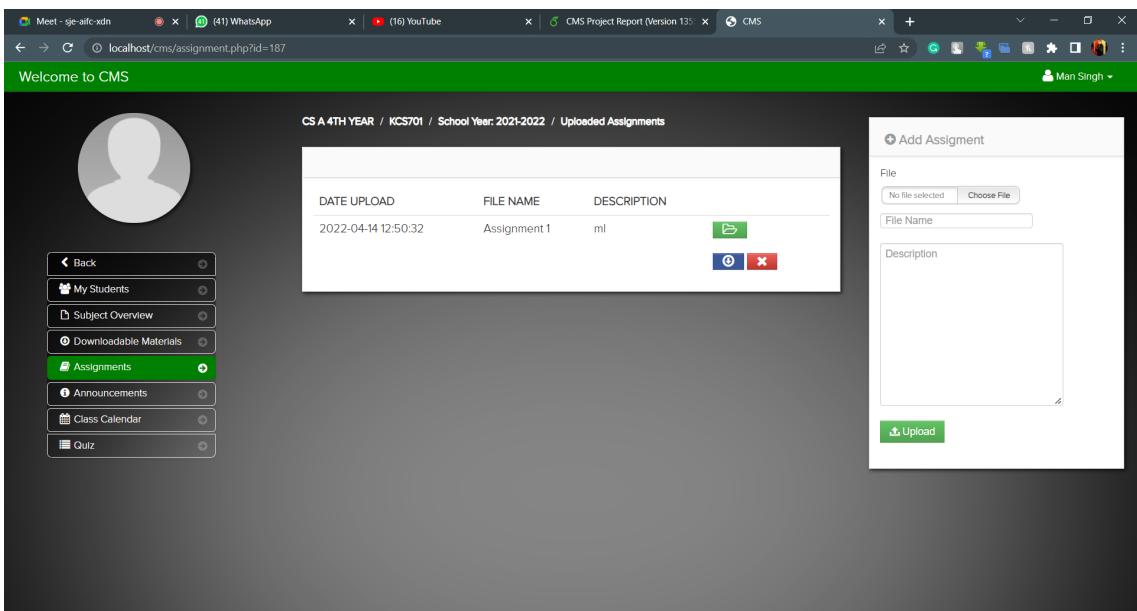


Figure 5.21: Uploaded Assignments

-> Teacher can upload assignments for students from this page.

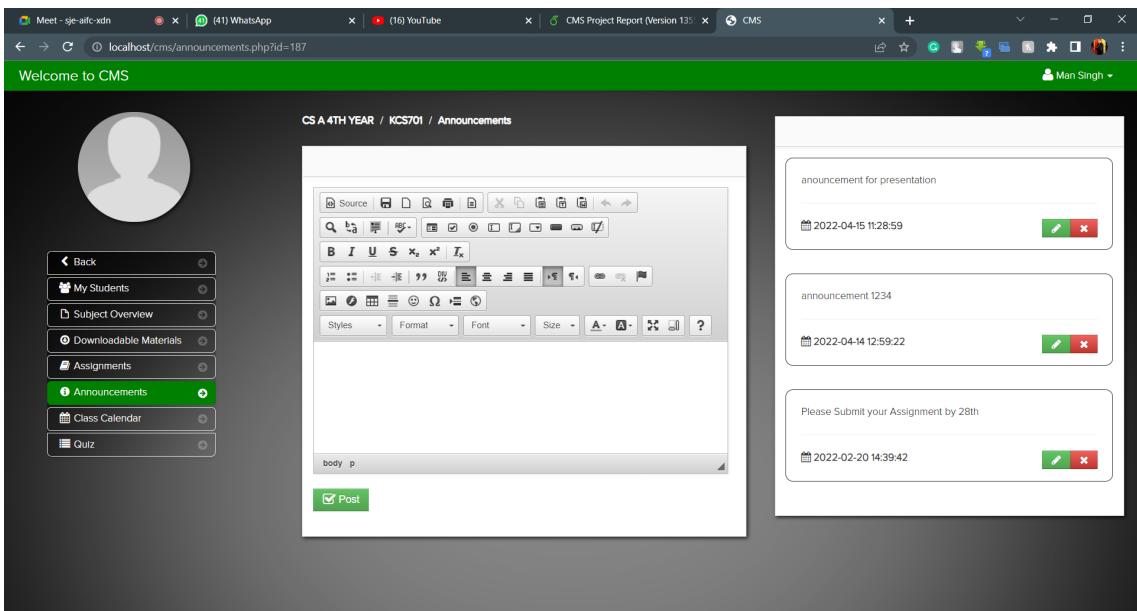


Figure 5.22: Add Announcements

-> Teacher can make announcements for students from this page.

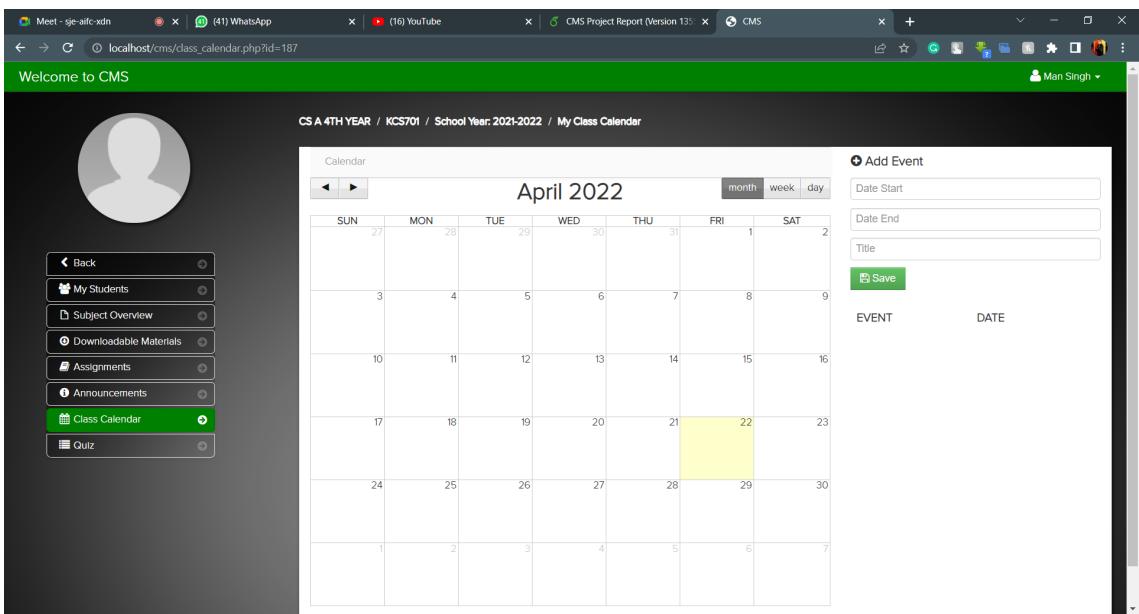


Figure 5.23: Class Calendar

-> Teacher can add upcoming events from this page.

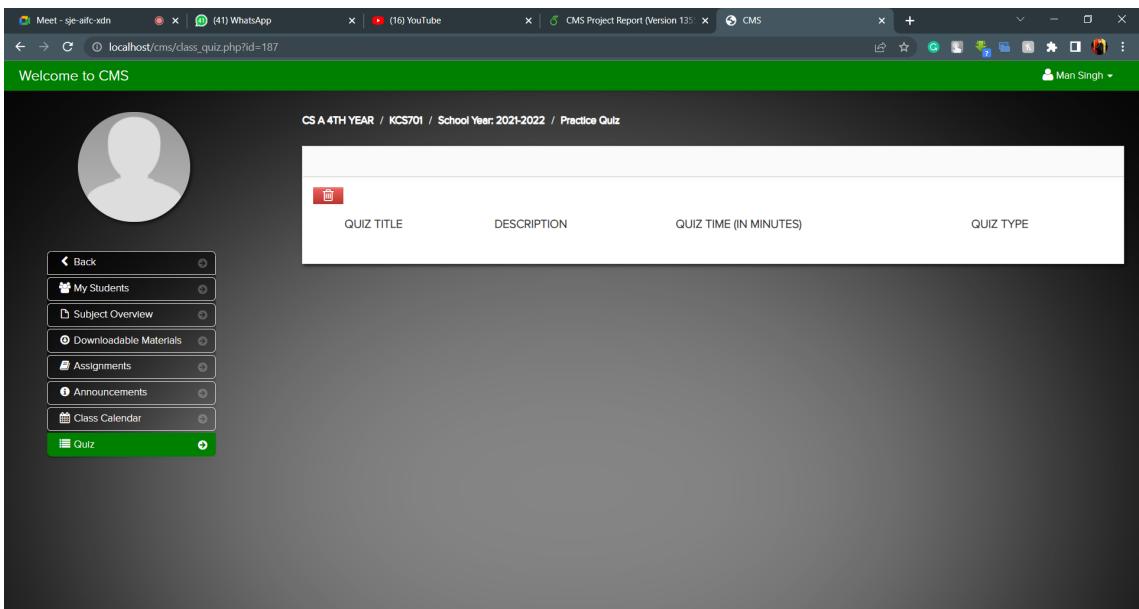


Figure 5.24: Quiz

-> Teacher can upload quizzes for students from this page.

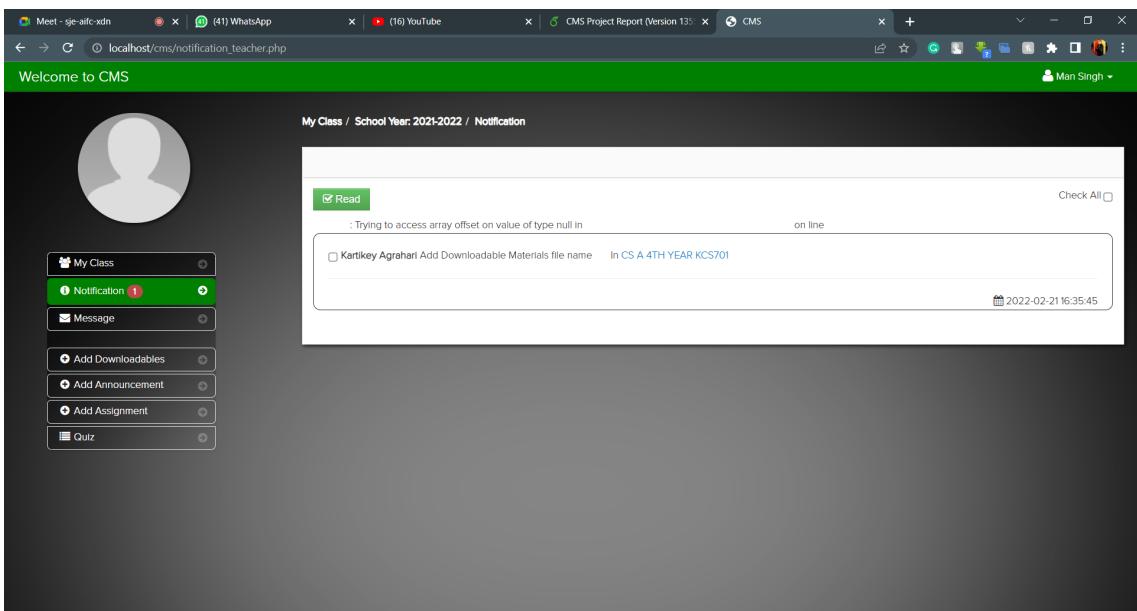


Figure 5.25: Notifications

-> Teacher can check his/her notifications from this page.

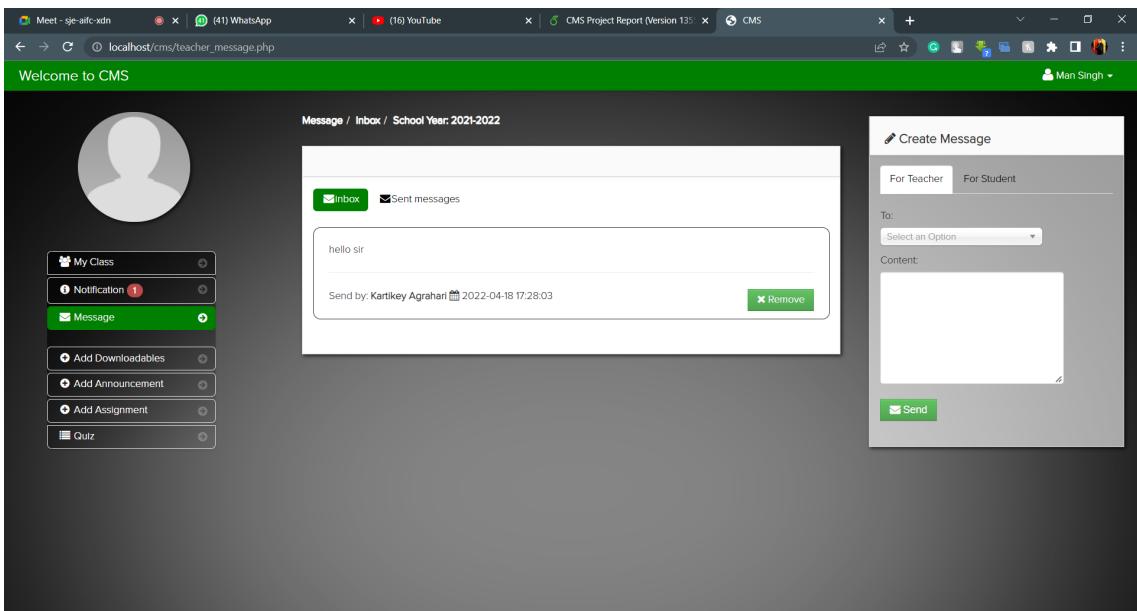


Figure 5.26: Message

-> Teacher can send and check received messages from this page.

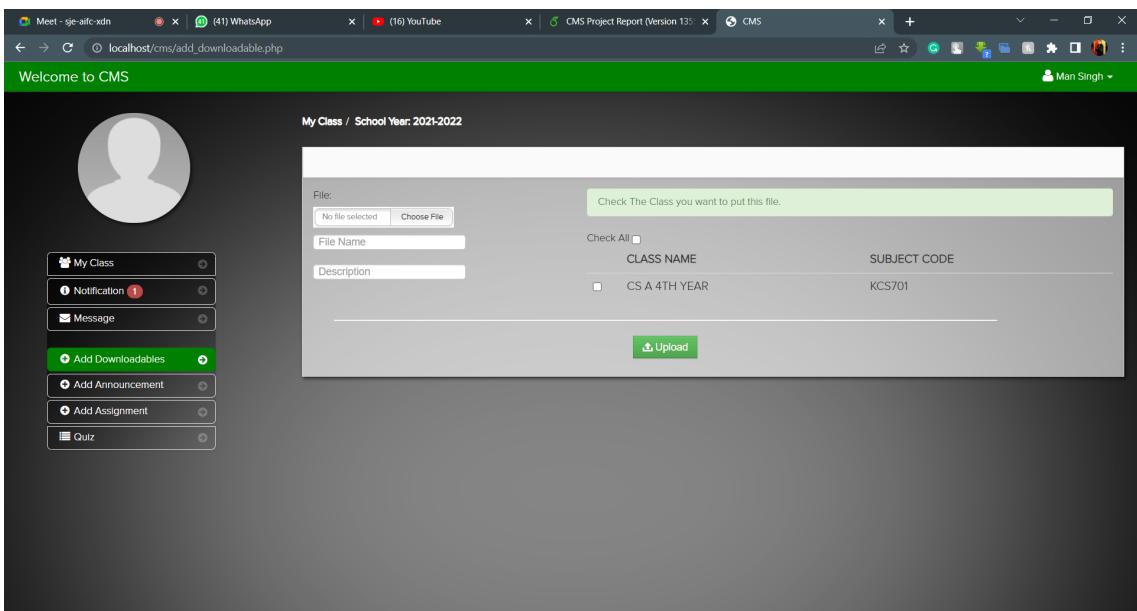


Figure 5.27: Add Downloadable

-> Teacher can upload study materials for students from this page.

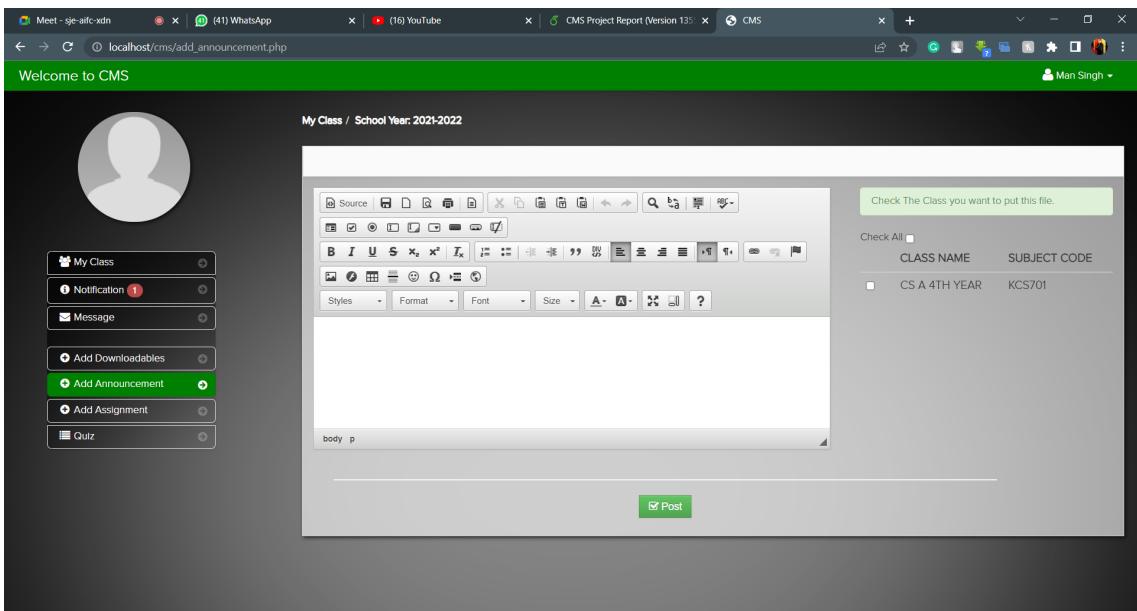


Figure 5.28: Announcements

-> Teacher can make announcements for students from this page.

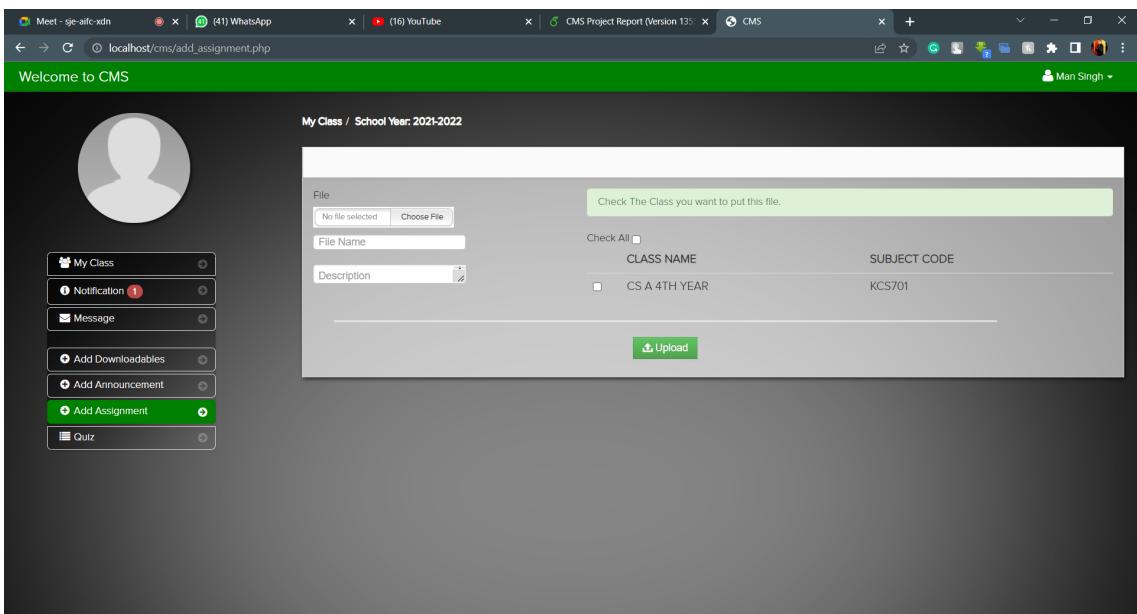


Figure 5.29: Assignments

-> Teacher can upload assignments for students from this page.

### 5.1.3 Student

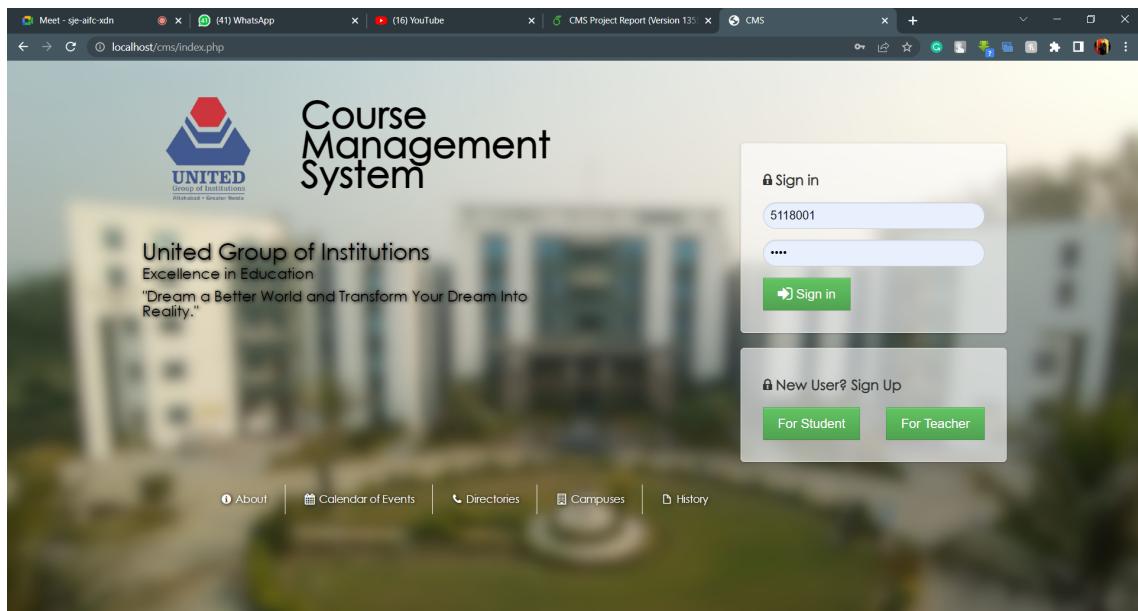


Figure 5.30: Student's Login Form

-> Student can enter his/her student id and password inthis form, to access his/her account.

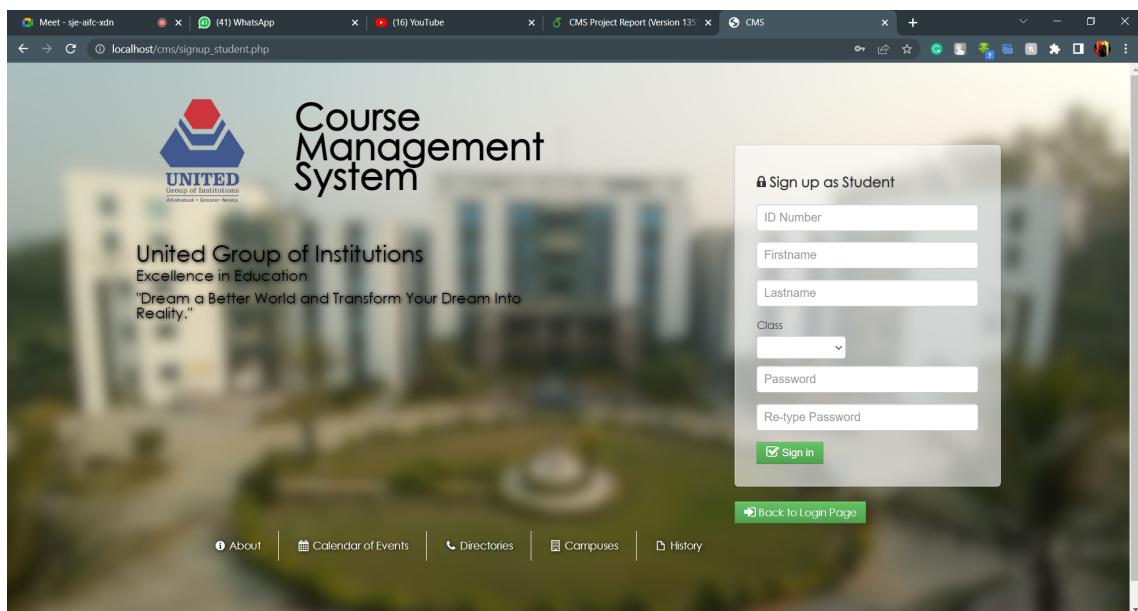


Figure 5.31: Students's SignUp Form

-> A new user can enter his/her basic details in this form, to get registered in the system.

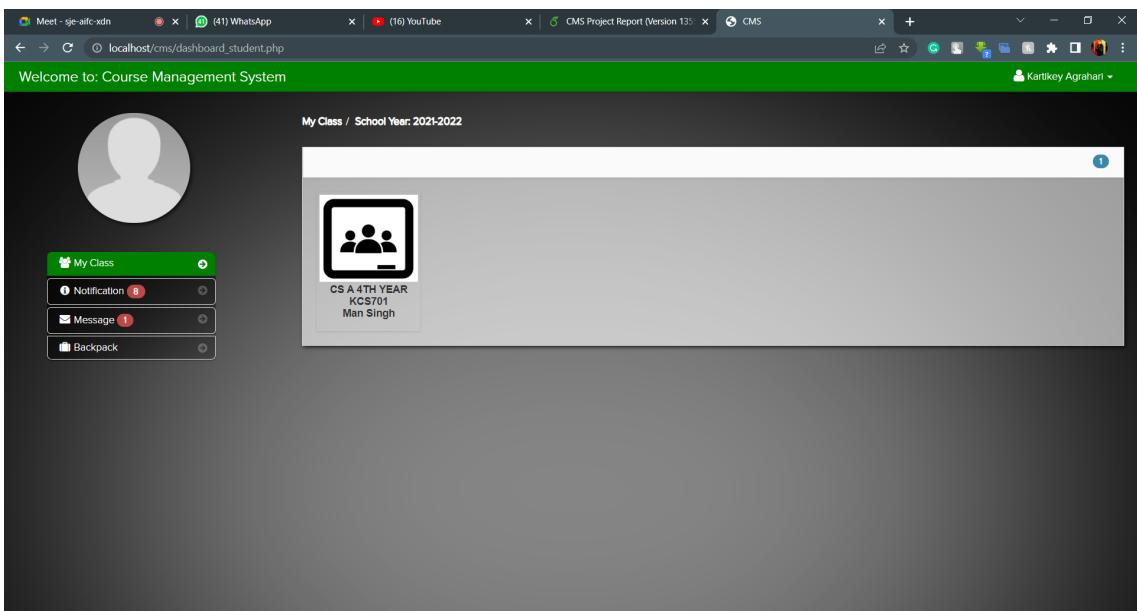


Figure 5.32: Student Dashboard

-> This is the home page of student's account.

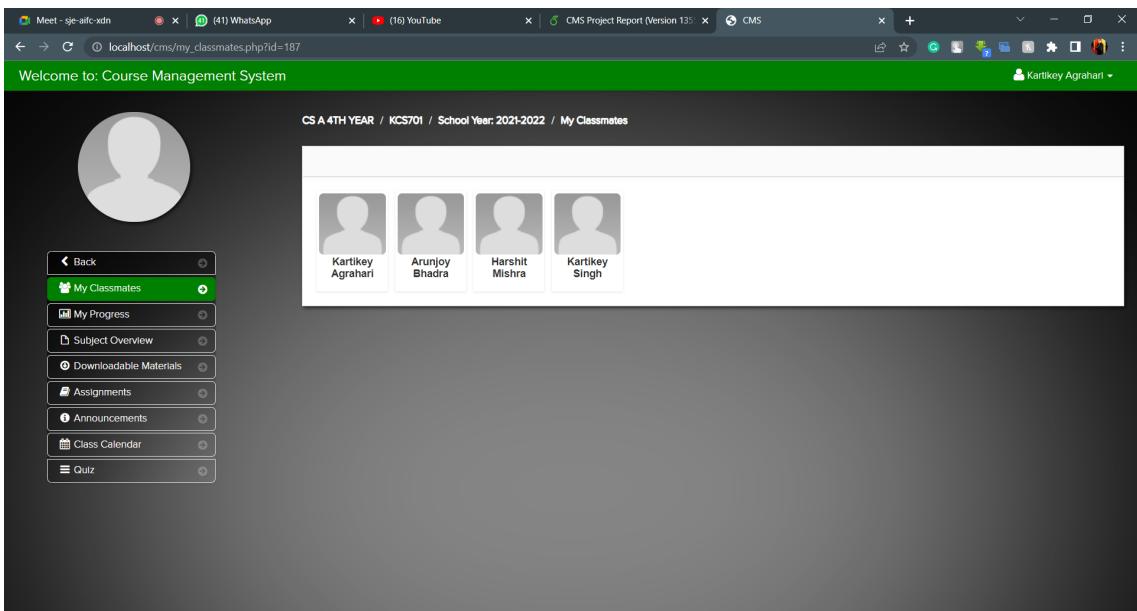


Figure 5.33: My Classmates

-> Student can check names of all of his/her classmates from this page.

The screenshot shows a web browser window with multiple tabs open. The active tab is titled 'CMS Project Report (Version 1.35)' and displays the 'Course Management System'. The main content area is titled 'Welcome to: Course Management System' and shows 'CS A 4TH YEAR / KCS701 / School Year: 2021-2022 / Progress'. On the left, there is a sidebar with a user profile icon and a navigation menu containing links like 'Back', 'My Classmates', 'My Progress' (which is highlighted in green), 'Subject Overview', 'Downloadable Materials', 'Assignments', 'Announcements', 'Class Calendar', and 'Quiz'. The main content area features two tables: 'Assignment Grade Progress' and 'Practice Quiz Progress'. The 'Assignment Grade Progress' table has columns for DATE UPLOAD, ASSIGNMENT, and GRADE. The 'Practice Quiz Progress' table has columns for QUIZ TITLE, DESCRIPTION, and QUIZ TIME (IN MINUTES).

Figure 5.34: My Progress

-> Student can check his/her grades and progress report from this page.

The screenshot shows a web browser window with multiple tabs open. The active tab is titled 'CMS' and displays the 'Course Management System'. The main content area is titled 'Welcome to: Course Management System' and shows 'CS A 4TH YEAR / KCS701 / Subject Overview'. On the left, there is a sidebar with a user profile icon and a navigation menu containing links like 'Back', 'My Classmates', 'Subject Overview' (which is highlighted in green), 'Downloadable Materials', 'Assignments', 'Announcements', and 'Quiz'. The main content area displays information about an instructor named 'Man Singh', showing a profile picture and a link to 'view info'.

Figure 5.35: Subject Overview

-> Student can check syllabus of all the subjects from this page.

The screenshot shows a web browser window with multiple tabs open. The active tab displays the 'Downloadable Materials' section of the CMS. The page header includes the school name 'CS A 4TH YEAR / KCS701 / School Year: 2021-2022 / Downloadable Materials'. On the left, there is a sidebar with navigation links: Back, My Classmates, My Progress, Subject Overview, Downloadable Materials (which is highlighted in green), Assignments, Announcements, Class Calendar, and Quiz. The main content area lists five downloadable items with columns for Date Upload, File Name, Description, and Uploaded By. A 'Copy Check Item to backpack' button is at the top left of the list. To the right, there is a form titled 'Add Downloadable' with fields for File (with 'No file selected' and 'Choose File' buttons), File Name, Description, and a 'Upload' button.

DATE UPLOAD	FILE NAME	DESCRIPTION	UPLOADED BY
2022-04-15 11:28:15	machine	learning	ManSingh
2022-04-14 12:51:26	CMS	Presentation document	ManSingh
2022-02-21 16:35:45	ML	Learning	KartikeyAgrahari
2022-02-20 14:32:46	Machine Learning	Notes to Machine Learning	ManSingh

Figure 5.36: Downloadable Materials

-> Students can download study materials from this page.

The screenshot shows a web browser window with multiple tabs open. The active tab displays the 'Assigned Assignments' section of the CMS. The page header includes the school name 'CS A 4TH YEAR / KCS701 / School Year: 2021-2022 / Assigned Assignments'. On the left, there is a sidebar with navigation links: Back, My Classmates, My Progress, Subject Overview, Downloadable Materials, Assignments (which is highlighted in green), Announcements, Class Calendar, and Quiz. The main content area lists one assignment with columns for Date Upload, File Name, and Description. A 'Submit Assignment' button is at the bottom right of the list.

DATE UPLOAD	FILE NAME	DESCRIPTION
2022-04-14 12:50:32	Assignment 1	ml

Figure 5.37: Assignments

-> Students can download assignments from this page.

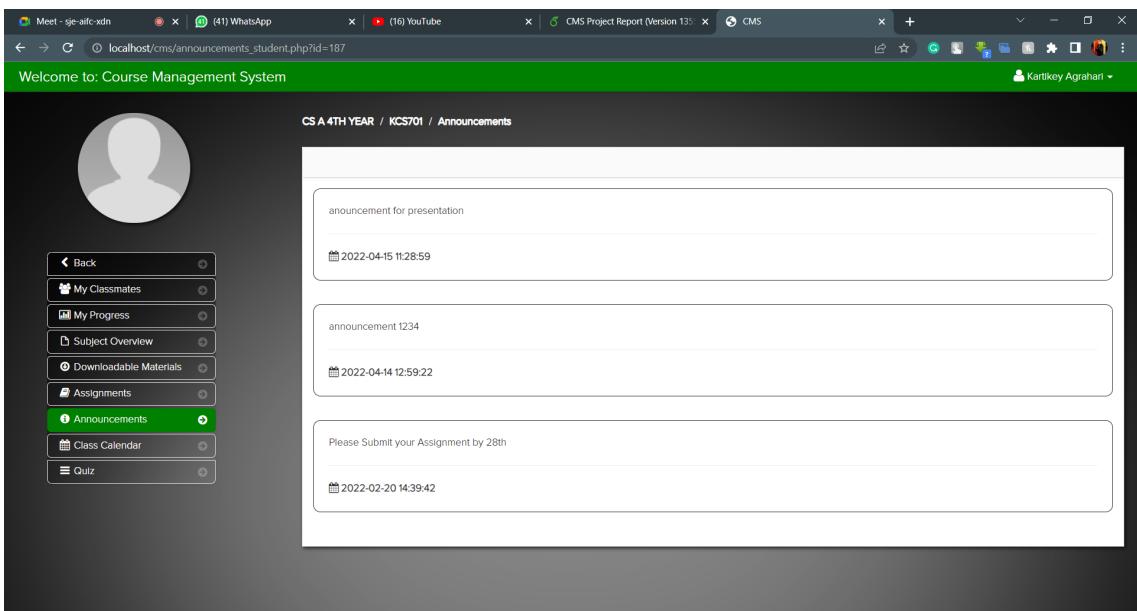


Figure 5.38: Announcements

-> Students can check announcements from this page.

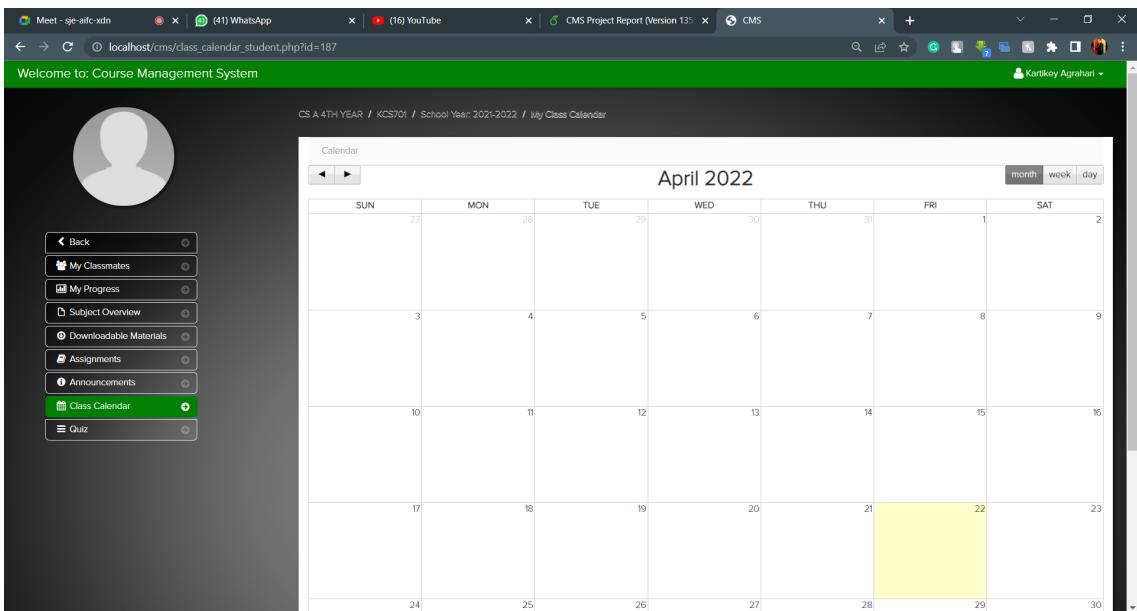


Figure 5.39: Class Calendar

-> Students can check details of upcoming events from this page.

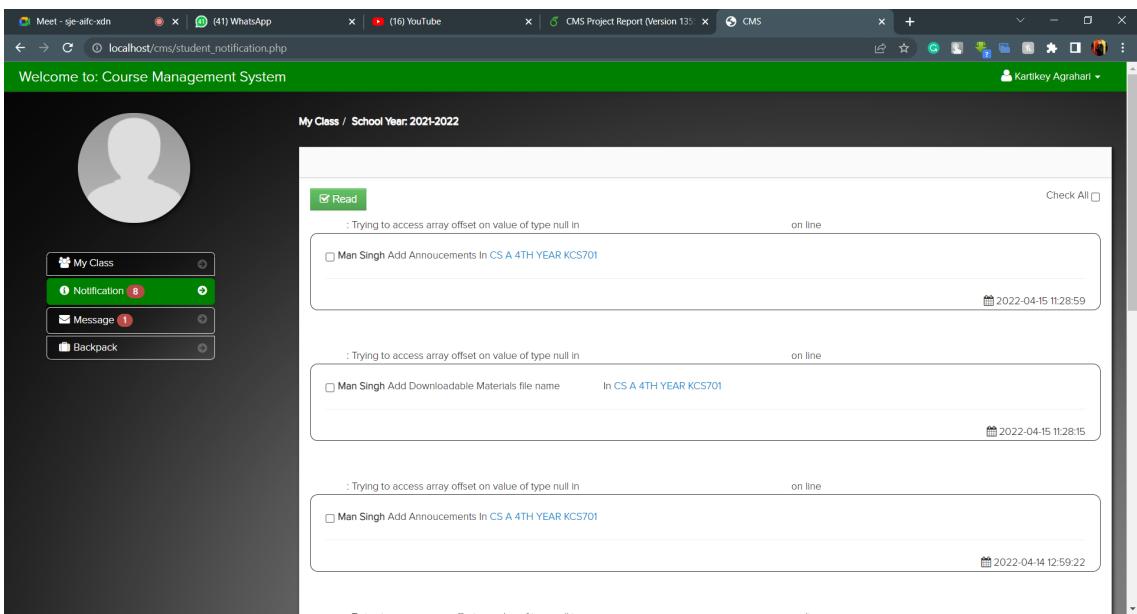


Figure 5.40: Notifications

-> Students can check his/her notifications from this page.

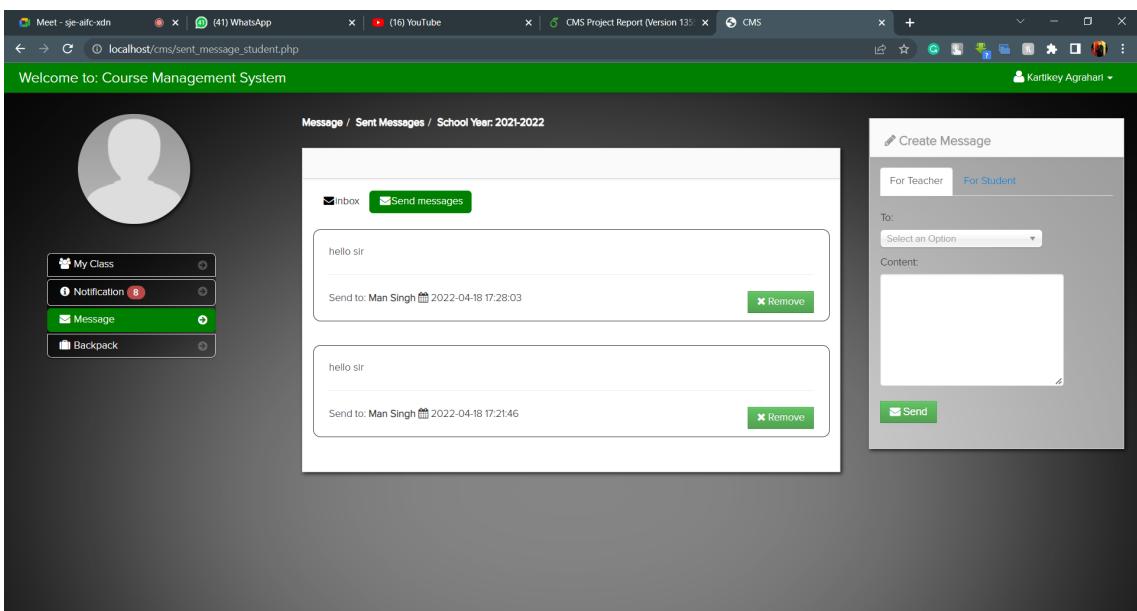


Figure 5.41: Message

-> Students can send and check received messages from this page.

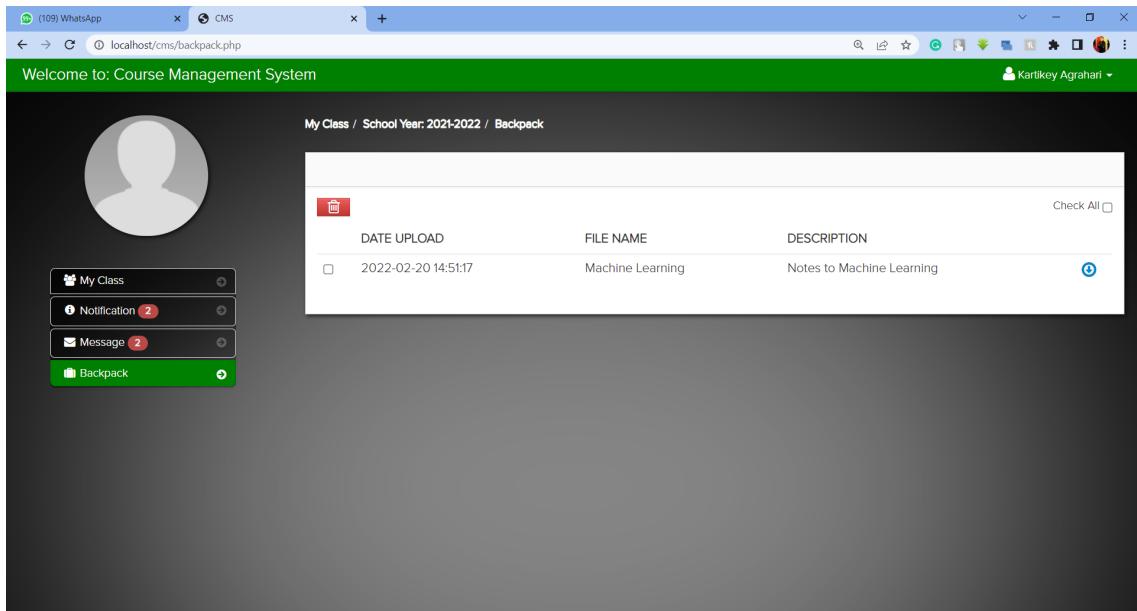


Figure 5.42: Backpack

-> Students can arrange important files by moving them into the backpack, from this page.

# **Chapter 6**

## **Testing**

After successful completion of implementation phase testing of the product is performed. Process of testing is usually referred as a subset of all the phases in the modern software development model, with testing activities mostly occurring in all the stages of the development process. Software testing is a process that should be done during the software development process to ensure that the software is of the highest quality.

Software testing can be defined as the process of verifying that a software or application is free of bugs and meets specifications based on its design and development and effectively meets the requirements of users, handling all exceptional and borderline cases.

After successful completion of our project we have performed three types of testing on our project, which are as follows:- Unit Testing, Integration Testing, System Testing.

### **6.1 TYPES OF TESTING**

#### **6.1.1 UNIT TESTING**

Unit testing is a type of software testing that tests individual units or components of a software application. The goal of validation is to ensure that each unit of the software meets its intended specifications. A unit is the smallest testable part of any software. A device that typically has one or a few inputs and a single output is typically used. In procedural programming, a unit can be a single program, function, procedure, or program module. In object-oriented programming, a method is the smallest unit of functionality. It may belong to a base class, an abstract class, or a derived class.

## **6.1.2 INTEGRATION TESTING**

Integration testing is a phase of software testing that evaluates the compliance of a system or component with specified functional requirements. Integration testing is conducted to ensure that a system or component works as intended when combined with other parts. After unit testing is complete, validation testing should be conducted. The integration test will use the modules that have been tested in units as input, group them into a larger collection, apply the tests defined in the integration testing plan to these pools and deliver the integrated system as an output to the system for testing.

## **6.1.3 SYSTEM TESTING**

System tests are a level of testing that validates the complete and fully integrated software product. System testing is a process used to evaluate the complete system specifications. Testing is a series of different tests that are designed to test the full computer-based system.

## **6.2 Test Cases**

### **6.2.1 Admin**

Sr. No	Test Case	Result
Test Case 1	Wrong login credentials	Access to Admin Panel denied.
Test Case 2	Admin with same username	New user account will not be created.
Test Case 3	Teacher with same username	New teacher will not be added.
Test Case 4	Student with same id number	New student will not be added.
Test Case 5	Department with same HOD and department name	New department will not be created.
Test Case 6	Class having same data	New class will not be created.

### **6.2.2 Teacher**

Sr. No	Test Case	Result
Test Case 1	Wrong login credentials	Access to account denied.
Test Case 2	Class with same class name, subject name and year	New class will not be created.
Test Case 3	File size more than 5 MB	File transfer gets failed.
Test Case 4	Message size more than 200 character	Message transfer gets failed.

### **6.2.3 Student**

Sr. No	Test Case	Result
Test Case 1	Wrong login credentials	Access to Student Panel denied.
Test Case 2	File size more than 5 MB	File transfer gets failed.
Test Case 3	Message size more than 200 character	Message transfer gets failed.

# **Chapter 7**

## **Conclusion and Future Work**

The project entitled "Course Management System" was completed on time and to the satisfaction of all involved. After going through all the phases we have now reached to the conclusion part of our project

### **7.1 Conclusion**

This project was carefully designed and free of errors, while also being more efficient than other options. The purpose of CMS was to utilize the advantages provided by technology and develop a website that can bring changes in teaching methodology by performing different tasks which are necessary to conduct online courses in a smooth manner such as availability of study material, regular assignments, regular assessment of students etc.

Result of Course Management System can be concluded into several points. First, with Course Management System, students of teaching institutions get a smooth experience during online classes, and can communicate with their teachers and classmates for discussions, and can take part in regular assignments and assessment quizzes to improve their performance. Course Management System provides multiple tools in teacher's dashboard, which give them permission to run and manage various courses being conducted at their institute.

This project has given us great satisfaction in having designed a website which can help people who are dedicated to learn and improve, and want to contribute in progress of society.

As, it is a web based platform which has been developed with the vision of bringing positive and revolutionary changes in teaching methodologies with the help of different technologies such as HTML, CSS, Javascript, PHP.

CMS allows both teachers and students to become a part of online learning process in a smooth & uninterrupted manner, so they can learn new things & contribute for the betterment of society. Outcome of the project Course Management System can be divide into two modules, which are as follows-

### **7.1.1 Teacher**

- Teachers will be able to run and manage multiple classes and their students with the help of their dedicated dashboard.
- They can add or delete data of students and classes from their account.
- They can upload study materials of limited data size (5 MB) in PDF format from their account.
- They can upload assignments in PDF format from their account.
- They can organize quizzes for regular assessment of students.
- They can make announcements for whole class from their account.
- They can send messages to individual students from chat section.
- They can upload subject related information and course overview.

### **7.1.2 Students**

- Students can download study materials in PDF format from their account.
- They can upload answer copies of their assignments in PDF format.
- They can take part in quizzes.
- They will receive notifications related to new messages, uploads, assignments, quizzes, announcements etc.
- They can message their teachers and other students.
- They can check their progress report.
- They can organize all the study materials in their account with the help of backpack option.

## **7.2 Future Scope**

Based on the feedback and analysis we have concluded that Course Management System can be made more efficient if it is combined together with online meeting software such as Zoom, Google Meet, Microsoft Teams etc.

We can add new features to the Course Management System to make it more effective and user friendly. For example,

- CMS can have a discussion forum for users to discuss doubts.
- We can add an online compiler by which students can learn and practice programming languages and teachers can conduct coding related exams and assignments on CMS.
- We can add a whiteboard option in CMS, which will help teachers in effective teaching.
- A real time chat box can be attached with Whiteboard, so students can solve their doubts in real time.

# **Appendix A**

## **Publication**

The part of the project is published in *International Research Journal of Modernization in Engineering Technology and Science*.

1. Kartikey Agrahari, Arunjoy Bhadra, Kartikey Singh, Harshit Mishra, “Course Management System” in International Research Journal Of Modernization In Engineering Technology And Science (IRJMETS), Volume 4, Issue 03, March 2022.

# Appendix B

## Conceptual Background

### B.1 HTML

HTML is known as Hypertext Markup Language<sup>16</sup> that is used to create the skeleton structure of web pages. Additionally, HTML can be used to create links between web pages. HTML contains different types of tags which are used to develop electronic documents called web pages. There are various types of tags that can be used to display tables, ordered lists, unordered lists and texts. The head section contains important information about the page, such as the title and the author. The body section contains all the content. The metadata that describes the page is inside the head section, while the visible content is in the body section. HTML is a platform-independent standard for representing web pages. Language so that it can be used on any platform, for example Macintosh, Windows, Linux etc. There are different HTML versions of the website. The newest version is HTML 5. These are more advanced features such as geolocation, native audio and video support, Canvas, web socket, etc. HTML is a simple language to learn and use. A developer can create an HTML file with a simple text editor and execute that file with the help of an internet browser.

**HyperText:** HyperText is a term for text that is within other text. A hypertext link is a type of link found within text. It allows you to jump to different parts of the text. When a user clicks on a specific link, it takes him/her to a new web page, this is called a hypertext link. HyperText links allow you to connect different web pages together.

**Markup language:** A markup language is a type of programming language which helps to format a text document according to specific layout and formatting conventions. Markup language

helps in making texts more dynamic and interactive in nature, which makes it easier for readers to interact with the text.

**Web Page:** A web page is a document written in HTML that a web browser translates into a viewing experience. To access a web page, you can use its URL. A Web page can be either static or dynamic. With the help of HTML, we can create static web pages.

## B.2 CSS

CSS<sup>15</sup> is a language that provides web designers authority to decide how their websites should look and behave when viewed on web browsers.

CSS (Cascading Style Sheet) is a text-based coding language that controls the appearance and behavior of websites in web browsers. The language lets web developers control various style elements and functions, like layout, color, fonts, and so on, which can affect the formatting and display of HTML documents.

The main goal was to separate the content of the document from the presentation of the document, which includes the use of elements of style, such as color, layout, and fonts. CSS is responsible for the overall design and appearance of websites. CSS lets you control the color, font, spacing, and layout of text. CSS is a style sheet that tells a web browser how to display the HTML on a web page.

## B.3 JAVA SCRIPT

JavaScript is a programming language that enables you to write code that makes websites and applications work. Many of these are related to how JavaScript is commonly executed directly in a web developer's browser, which is commonly used in web development. Netscape originally created Dynamic HTML as a way to allow for dynamic and interactive elements on websites. JavaScript is based on Java, which is a programming language that shares a syntax with C. JavaScript is written in ECMAScript specifications, which were developed by Sun Microsystems.

JavaScript may be used as a client-side scripting language, which suggests that the ASCII text file is processed by the client's browser instead of by an online server. This can load the webpage without needing to communicate with the main server using JavaScript. A JavaScript

function may check an internet form to make sure all the specified fields are filled out before it's submitted. The JavaScript code can generate an error message before it sends any information to the server.

JavaScript code often lives on the server, just like server-side scripting languages like PHP and ASP. The HTML output from the server is displayed on the page, but the script code is still visible in the source of the page. The file can be included as a separate file, which can be displayed in the browser.

JavaScript has several advantages and disadvantages, but it is still a very powerful and popular programming language. JavaScript is often used on a client's browser to directly control the web page. JavaScript has the same capabilities as server-side languages, making it faster and easier to develop and deploy your web applications.

## B.4 MySQL

MySQL is a database management system that is based on a structured query language. MySQL is free, open source database software under the GNU License. It is believed by Oracle Company that this is the correct course of action.

Server side languages are programs that run on the server side of a computer system. This software is available on many different platforms and can be used in many different languages. The software is very fast and efficient when handling large data sets.

MySQL is a popular database management system software that is often used to manage relational databases. The database management system (DBMS) is fast, scalable, and simple to use in comparison to Microsoft SQL Server and Oracle Database. PHP is often used in conjunction with other programming languages to create powerful, dynamic server-side or web-based applications.

MySQL follows the behavior of the client-server architecture. This model is designed for people who want to access resources from a central computer using network services. The clients use a graphical user interface to request output, and the server will promptly provide the requested information once the instructions are matched.

## B.5 PHP

PHP<sup>13</sup> stands for a server-side scripting language. This suggests that applications written in PHP run on web servers and don't require the user to access the internet. PHP's syntax is similar to C's syntax. Rasmus Lerdorf created the language in 1995. PHP is being widely used to develop web applications and it is one of the main languages developers use to create new applications. Leading social networking sites like Facebook and respected organizations like Harvard University use PHP, which has made PHP popular and given it increased credibility. Despite its simplicity, PHP has become a popular choice for web development due to its many advantages. The technology is very effective and has many convenient tools to help with development. PHP is one of the hottest programming languages on the market, ranking fifth according to recognition from Index (PYPL).

## B.6 XAMPP

XAMPP<sup>24</sup> is a free, open-source web server solution stack that includes the Apache HTTP Server, MariaDB database, and interpreters for scripts written in the PHP and Perl programming languages. Since many web servers are based on the same components as XAMPP, it's possible to transition a local test server to a live server by using the same components.

The simple deployment of XAMPP means that a WAMP or LAMP stack can be easily installed by a developer on the operating system, with the advantage that common add-ons such as WordPress and Joomla! are readily available. Bitnami makes it easy to install applications quickly and easily. One of the advantages of using XAMPP is that it is easy to set up a WAMP web server stack. Later on, some popular bundled applications were made available that can be easily installed by Bitnami.

XAMPP was created as a development tool for website designers and programmers, allowing them to work on their projects without any connection to the internet. Many important security features are disabled by default, which makes your computer more accessible and less secure. XAMPP can serve web pages on the internet. A security feature is included to protect the most important parts of the package. XAMPP allows you to create and work with databases in a variety of formats, including MariaDB and SQLite.

## B.7 SDLC

The Software Development Life Cycle<sup>17</sup> (SDLC) is a sequence of steps in order to create, develop, and test software. The software development life cycle (SDLC) produces good-quality software that should fulfill the requirements of our customer and is completed within the expected time frame and budget. The SDLC is a model for developing software that outlines the stages through which a project will progress.

This process is undertaken by a software organization for the development of a project. A software development plan outlines how the software will be developed, maintained, replaced, and/or enhanced. The life cycle not only provides a way to improve the quality of software but also the overall process of development.

### **Stages of SDLC Model :-**

- > Requirement gathering and Analysis
- > Design Phase
- > Implementation Phase
- > Testing Phase
- > Deployment Phase
- > Review
- > Maintenance

### **Classification of SDLC Models :-**

There are various<sup>1</sup> software development models available, and each is followed during the software development process. These models are known as software development process models. Each software development process<sup>22</sup> follows a series of steps specific to that process to ensure success. Following are the most important and popular SDLC models followed in the industry-

- > Waterfall Model
- > Spiral Model
- > V-Model
- > RAD Model
- > Iterative Model

## B.8 Waterfall Model

The waterfall model<sup>18</sup> is a classical model used in software development life cycle to create a system which is a linear and sequential way. In this waterfall model is a progression from one stage to another, which is in a downward fashion. This model can be divided into different stages, and the results of one stage can be used as the input for the next stage. Each of the stages must be completed before the next one begins and there is no overlap in the stages.

The waterfall model can be described as an example of a sequential model. The waterfall model is the first and most popular SDLC process model. It divides software development into different phases, each of which has a series of tasks and specific objectives.

In fact, the first model used widely in the software industry was this one. There are different phases in a process, and each phase produces an input which becomes the input of the next phase. It is necessary that the stage be completed before the next stage begins. There is no overlap in the waterfall model.

In the waterfall development, a project progresses through distinct phases in a sequential manner, only once the previous phase has been completed. Each phase of the waterfall model is very well defined, due to its particular nature. The waterfall methodology uses a sequential approach to software development. This means that each phase is lower in the hierarchy than the one before it, like a waterfall. The project can be simplified into a series of tasks, with each higher level grouping referred to as a phase. The correct waterfall approach requires a phase which can be completed in sequence and has formal termination criteria (usually approved by the project's stakeholders).

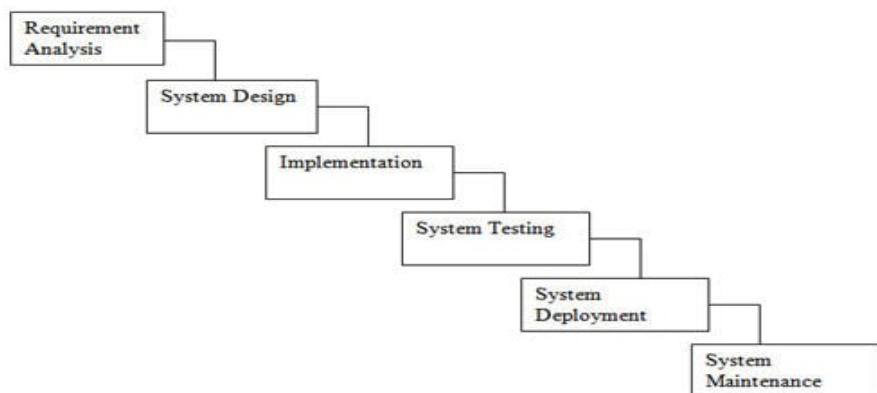


Figure B.1: Waterfall Model

## B.9 Spiral Model

The spiral model<sup>19</sup> which is very much similar to that of incremental development process for a system, with more emphasis placed on risk analysis. The spiral model which has these four phases: Planning, Design, Construction, and Evaluation. A software project goes through these phases repeatedly during iterations (called spirals in this model). The radius of the spiral at any point measures the cost of the project to date, and the angular dimension shows how far the project has progressed in the current phase.

The spiral shape is evident in its diagrammatic representation, which is why it's called a Spiral. The spiral process is made up of a series of loops, each of which is called a phase of the software development process. This model has the ability to handle risks.

The spiral model is one of the most important software development life cycle models, which helps to manage risk. The diagram looks like a spiral with many loops. There is no known definitive number of loops in a spiral pattern. This will vary depending on the specific project. Each loop in the spiral represents a phase of the software development process. The number of phases needed to develop the product can vary depending on the risks involved in the project. As project manager, you have an important role in developing a product using the spiral model. By dynamically determining the number of phases, you help ensure that the project follows a logical and consistent approach.

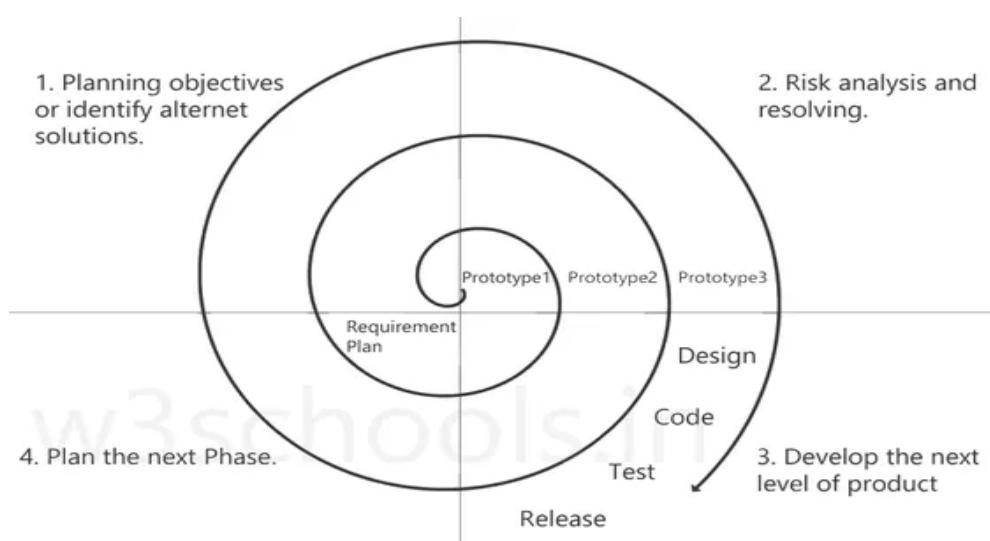


Figure B.2: Spiral Model

## B.10 V Model

The V-Model is also known as the Verification and Validation Model. It is a tool that helps you verify and validate your software. In this, each stage of the SDLC must be completed before the next stage can begin. The sequential design process is similar to the waterfall model. Testing of the device is planned in parallel with the development of the device.

**Verification:** The method involves a review of code without actually executing it. The process of evaluation of product development is used to determine whether the specified requirements have been met.

**Validation:** The analysis technique uses a functional approach as well as testing code to determine how the system behaves. Validation is the process of classifying software after the development process is complete to determine whether the software meets customer expectations and requirements.

The V-Model includes verification phases on one side of validation phases on the other side. The verification and validation process is followed by the coding phase in a V-shape. The V-Model is a model that predicts the outcome of a given event by considering the variables that are influencing it.

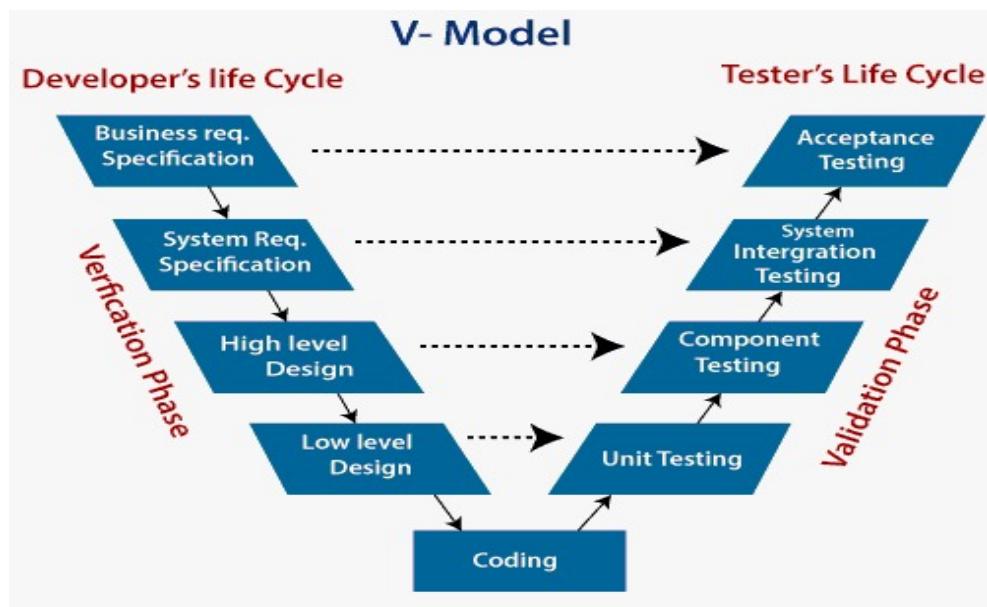


Figure B.3: V-Model

## B.11 RAD Model

In the following model of Rapid Application Development<sup>21</sup>, it is a software development process that is based on prototyping without any specific planning. In this RAD model, the focus is more on the development tasks, rather than the planning stages. This software development tool is designed to help developers create software quickly. The RAD model which is based on iterative prototyping and iterative development, which means that there is no need for any specific planning before starting. With rapid application development, you can make multiple iterations and updates to a software rapidly without needing to start from scratch each time.

Development of each module typically involves the following basic steps: analyzing, designing, coding, and testing. Another remarkable feature of this model is its short delivery time frame—usually in the range of 60 to 90 days. The information management system (IMS) focuses on the input-output sources and destinations of information. Delivering projects in small pieces is emphasized; large projects are divided into a series of smaller projects to make them more manageable. The main benefits of using RAD modeling techniques are that they help you reuse templates, tools, processes, code. The development process is based on prototyping and iteration, with no specific planning involved. The process of writing the software itself includes the planning required to develop the product.

Fig: RAD Model

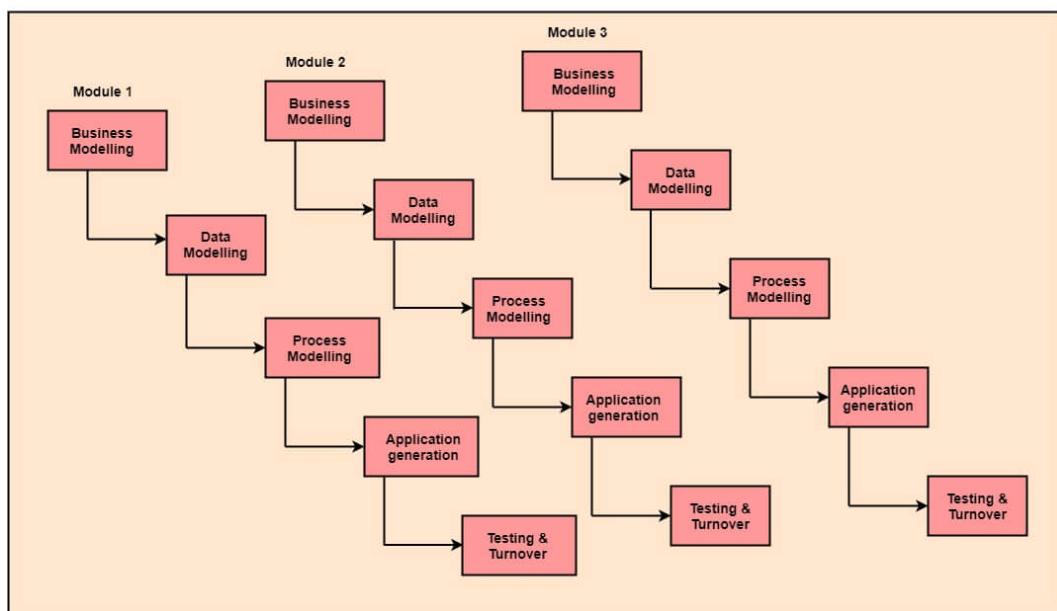


Figure B.4: RAD Model

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